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**DRAFT**

**ENGINEERING EVALUATION AND COST ANALYSIS  
FOR THE FORMER USS WASHTENAW COUNTY (LST-1166)**

**REVISION 4**

**Submitted to:**

**U.S. Environmental Protection Agency  
Region 10  
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## EXECUTIVE SUMMARY

This Engineering Evaluation/Cost Analysis (EE/CA) Report addresses the former USS Washtenaw County, a 2,590-ton [Terrebonne Parish-class](#) tank landing ship (hereinafter referred to as LST-1166), which is currently located in the Columbia River near Dibblee Point, Columbia County, Oregon.

The United States Coast Guard (USCG) has tasked the United States Environmental Protection Agency (EPA), under a Pollution Removal Funding Authorization (PRFA) dated 2 September 2010, with preparation of the EE/CA Report for LST-1166. The EPA has subsequently contracted TechLaw, Inc. (TechLaw) under Contract Number EP-S7-06-03 and Technical Direction Document (TDD) 10-12-0040 to assist with the preparation of this EE/CA Report.

This EE/CA Report has been completed as required by 40 Code of Federal Regulations (CFR) 300.415(b)(4) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and was prepared using *Guidance on Conducting Non-Time Critical Removal Actions under CERCLA*, EPA/540-R-93-057, dated August 1993 (EPA 1993).

LST-1166 is currently located at Dibblee Point along the south bank of the Columbia River, south of Lord Island at River Mile No. 63 ([Figure 1](#)). It is located approximately 4.5 miles west-northwest of Rainier, Oregon and approximately 1.25 miles downstream and south of Longview, Washington. LST-1166 is located in the DELENA United States Geologic Survey (USGS) topographic map quadrangle at 46° 7'17.82" N 123° 0'52.24"W (1927NAD).

The vessel is currently owned by USS Washtenaw County- LST-1166, LLC, a defunct non-profit organization. The current owner originally purchased the vessel with the intent of converting it to a maritime museum. In 2002, the vessel was towed to its current location and some refurbishing was conducted; however, conversion to a maritime museum was not successful.

On May 29, 2003, USS Washtenaw County - LST-1166, LLC formerly doing business as Amphibious Forces Memorial Museum (AFMM) purchased the vessel. The company was administratively dissolved on August 4, 2006, reinstated on September 24, 2007, and dissolved again on August 1, 2008. The USCG Sector Portland (now renamed Sector Columbia River) issued three Administrative Orders and a Captain of the Port (COTP) order to the owners prior to the 2008 dissolution of the company for environmental cleanup and mitigation of the potential threats from the vessel, but the owner was unable to comply with the Orders. The Certificate of Financial Responsibility (COFR) Guarantor for the vessel, Lloyd's of London, sought to dispose of the vessel at sea under EPA's general permit for the transportation and disposal of vessels, but when that request was denied based on the contaminants aboard the vessel, the Guarantor cancelled the COFR as of February 7, 2008.

LST 1166 is moored on the banks of the Columbia River. The vessel's hull has been compromised; it is in hydraulic communication with the river, resulting in flooding of the lower two decks. The USCG previously removed most ~~all~~ oils and lubricants, with exception of the oil observed floating on a flooded deck. The vessel is deteriorating. Interior paint is peeling and flaking to the interior deck floors. Exterior lead-based paint has the potential to flake into the river. Water in the flooded levels of the vessel is in contact with lead-based paint, PCB-containing paint and electrical wiring. Asbestos-containing material (ACM) which remains in the vessel is not currently friable.

**Commented [NU1]:** Can't remove "most all" oils so best word choice is "most"

Human health and ecological streamlined risk evaluations were performed for the EE/CA. The Site characterization information, and identification and analyses of the removal action alternatives presented in this EE/CA are based on the findings and investigations conducted by USCG and EPA and information obtained from various sources.

The results of the human health streamlined risk evaluation indicated threats from exposure to contaminants onboard the vessels are limited to trespassers and potential workers. Contaminants of potential concern (COPCs) which are listed hazardous substances or oils include polychlorinated biphenyls (PCBs) in some interior painted surfaces, PCBs within asbestos insulation on wiring, non-friable asbestos in flooring, encapsulated asbestos on bulkheads and piping, lead-based paint on interior and exterior surfaces, and oily water in flooded spaces in lower decks. Other potential areas of PCB contamination that have been documented in other similar-aged Navy vessels, but not previously evaluated or confirmed in the LST-1166, include PCBs within bulkhead insulation. The elevated concentration of hazardous substances and exposure of contaminated surfaces or lead dust to the environment, as well as potential vapors and contact with oil indicates that inhalation, ingestion and dermal exposure pathways potentially exist. Trespassers could be exposed to the contaminants. In the event of future recycling activities workers may have occupational exposure. Other pathways (e.g., soil, surface water, sediment, ground water) are not complete for human health. Threats to recreationists do not exist because the pathway to the interior of the vessel is incomplete and there are not threats of exposure associated the exterior (hull) of the vessel. The results of the ecological risk assessment indicated that the USCG removed hazardous materials, the oils and lubricant from the vessel during an earlier removal action eliminating risks to ecological receptors. We have determined that the proposed project will have no effect on the species and critical habitat identified in Section 1.4 during the removal and transportation elements of the action or at the proposed disposal site.

**Commented [NU2]:** How can we say "eliminating"? Wouldn't "significantly minimizing" be far more accurate? Suggest replacing the word with "significantly minimizing".

The scope of the recommended removal action is the reduction of the hazardous substances to acceptable human health and ecological risk-based concentrations. Additionally, removal of the

vessel would eliminate the attractive nuisance platform it poses for drug use, thieves and illegal scrappers, and ~~it~~ would remove any potential navigational hazard and adverse aesthetic impacts.

To achieve these objectives, the EE/CA identified removal action alternatives, including

Alternative 1: Sealing, Securing, and Berthing In Place

Alternative 2: Ocean Disposal with Partial Decontamination and TSCA PCB Bulk Product Waste Risk-Based Disposal Approval

Alternative 3: Ocean Disposal with Partial Decontamination and TSCA 9b Finding for Disposal of PCBs under the Marine Protection, Research, and Sanctuaries Act (MPRSA)

Alternative 4: Decontamination, Dismantling and Recycling/Disposal (Shipbreaking)

The recommended alternative for the removal action is subject to the decision of the USCG.

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**REVISION 4**

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## ABBREVIATIONS AND ACRONYMS

ACM	Asbestos Containing Material
ACP	Area Contingency Plan
AF	Anti-fouling
AFMM	Amphibious Forces Memorial Museum
AOR	Area of Responsibility
ARAR	Applicable or Relevant and Appropriate Requirements
BMP	Best Management Practices
B <sub>cv</sub>	Bioaccumulation critical value
CBR	Critical body residue
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COFR	Certificate of Financial Responsibility
COPC	Constituents of Potential Concern
COTP	Captain of the Port
CWA	Clean Water Act
DLCD	Department of Land Conservation and Development
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
ERL	Effects Range-Low
F	Fahrenheit
GIS	Geographic Information System
ISM	In solid materials
mcy	million cubic yards
mcy/yr	million cubic yards per year
mph	miles per hour
mg/kg	milligram per kilogram
mg/L	milligram per liter
mm	millimeter
MPRSA	Marine Protection, Research, and Sanctuaries Act
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NTCRA	Non-Time Critical Removal Action
O&M	Operation & Maintenance
ODGP	Ocean Dumping General Permit
OPA	Oil Pollution Act
OSLTF	Oil Spill Liability Trust Fund
PAH	Polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PEO	Program Executive Office
PPE	Personal Protective Equipment
ppm	parts per million
PRFA	Pollution Removal Funding Authorization
PRSC	Post Removal Site Control
RAO	Removal Action Objective

RCRA	Resource Conservation and Recovery Act
TBC	To Be Considered
TechLaw	TechLaw Inc.
TSD	Treatment, Storage and Disposal
TDD	Technical Direction Document
TSCA	Toxic Substances Control Act
TSV	Tissue screening value
µg/L	micrograms per liter
µg/ft <sup>2</sup>	micrograms per square foot
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USDOJ	United States Department of Justice
USGS	United States Geological Survey

## 1.0 SITE CHARACTERIZATION

This section of the Engineering Evaluation/Cost Analysis (EE/CA) presents general information regarding the vessel including the location, operations and history of the vessel. The environmental setting of the area is described along with the adjacent land use, population near the site, meteorology, and sensitive ecosystems. Previous response actions that have been conducted are also described. Information related to source, nature and extent of contamination associated with the vessel are provided.

### 1.1 Site Description and Background

Site description including description of the vessel location, the Columbia River, topography, land use and climate are discussed below.

#### 1.1.1 Vessel Location

LST-1166 is currently located at Dibblee Point along the south bank of the Columbia River, south of Lord Island at River Mile No. 63 ([Figure 1](#)). It is located approximately 4.5 miles west-northwest of Rainier, Oregon and approximately 1.25 miles downstream and south of Longview, Washington. LST-1166 is located in the DELENA United States Geologic Service (USGS) topographic map quadrangle at 46° 7'17.82" N 123° 0'52.24" W (NAD27).

#### Columbia River

The Columbia River navigation channel begins at the Columbia River bar and continues five miles upriver at a depth of 55 feet and a width of 2,640 feet. After which, it maintains a depth of 43 feet and a width of 600 feet for 100 miles to the Portland Harbor. The Barlow Channel, which runs adjacent to the LST-1166, has an approximate depth of 40-43 feet (NOAA *undated*).

#### 1.1.2 Vessel History

LST-1166 was built in Sturgeon Bay, Wisconsin. It was commissioned in late October 1953 and served in the western Atlantic and Caribbean areas for two years. At the beginning of July 1955 the ship was renamed the *USS Washtenaw County*. From January to May of 1956 the ship served in the Mediterranean Sea as a unit of the Sixth Fleet and in mid-January 1958 passed through the Panama Canal to join the Pacific Fleet. *USS Washtenaw County's* first regular Western Pacific cruise began in April 1959 and was completed in September.

*USS Washtenaw County* spent the next thirteen years participating in Seventh Fleet amphibious training and logistics activities ([Photograph 1](#)). Beginning in mid-1964 the *USS Washtenaw County* was involved in Vietnam War operations. The last of *USS Washtenaw County*'s wartime assignments ended in mid-1972. In 1973 the ship underwent conversion to a special minesweeper and in February 1973 was decommissioned. *USS Washtenaw County* was inactivated at Yokosuka, Japan, in August 1973. The ship was stricken from the Naval Vessel Register late in August 1973, ~~and was sold at the end of January 1975 (Naval History and Heritage Command 2006).~~

LST-1166 was subsequently purchased by foreign interests. It was registered commercially as *Al Manhal I* from 1973 to 1980 and as *El CentroAmericano* from 1980 to 1984. In 1980, LST-1166 was towed to Astoria, Oregon because of mechanical issues, and it has been moored at various locations along both the Willamette and Columbia rivers. In 2002, the owner of the LST-1166 was granted temporary permission to moor at Dibblee Point, approximately 1.25 miles south of Longview, Washington (USCG 2009).

**Commented [NU3]:** There is a date discrepancy here. If the vessel was not sold until January 1975 as indicated in the paragraph above, then the vessel could not have been registered commercially in 1973. It is likely that the 1975 date is incorrect. Consequently, my suggestion is to delete the last sentence of the preceding paragraph as indicated.

The vessel is currently owned by *USS Washtenaw County - LST-1166, LLC* a defunct non-profit organization. The current owner originally purchased the vessel with the intent of converting it to a maritime museum. In 2002, the vessel was towed to its current location and some refurbishing was conducted; however, conversion to a maritime museum was not successful.

*USS Washtenaw County - LST-1166, LLC*, formerly doing business as Amphibious Forces Memorial Museum (AFMM) purchased the vessel on May 29, 2003. The company was administratively dissolved on August 4, 2006, reinstated on September 24, 2007, and administratively dissolved again on August 8, 2008. The USCG Sector Portland issued three Administrative Orders and a Captain of the Port (COTP) order to the owners for environmental cleanup and mitigation of the potential threats from the vessel, but the owner did not comply with the orders. The Certificate of Financial Responsibility (COFR) Guarantor for the vessel, Lloyd's of London, cancelled the COFR as of February 7, 2008, after a request to dispose of the vessel at sea under the EPA general permit for transportation and disposal of vessels was denied based on contaminants aboard the vessel. The owners have been unresponsive and unable to conduct a cleanup of the vessel. The current owner, *USS Washtenaw County - LST-1166, LLC* is, for all intents and purposes, financially defunct.

The vessel has become an attractive nuisance since being moored at its present location, and presents consistent problems for local, state, and federal agencies, as well as potential exposure and physical safety dangers to any persons boarding the ship. -Trespassing aboard the vessel appears to have begun in 2004. Reports of vandalism, illegal methamphetamine activity, illegal

dumping of waste oil and stripping and theft of metal, wiring, piping, hatches and valves have since occurred (EPA 2010b). Deck floors throughout are deteriorated, there is no electrical lighting available, and there are safety dangers due to dark spaces and open hatches. See [Photographs 2 through 6](#), which document existing conditions.

The LST-1166 hull has deteriorated and the vessel has taken on water from a leaking seal. The LST required 136 temporary patches in the hull to dewatering during for emergency removal work and of these, at least one has failed in the last three years and the lower two decks have flooded. This has resulted in the flooding of the lower two decks and the engine room (EPA 2010b). The ship is still floating in place due to foam buoyancy, with approximately two feet of water below the vessel at low tide (USCG 2011).

### 1.1.3 Surrounding Land Use and Populations

LST-1166 is currently located at Dibblee Point along the south bank of the Columbia River, across and south of Lord Island at River Mile No. 63. Dibblee Point is a 110-acre parcel located just outside the city limits of Rainier, Oregon and is owned by the State of Oregon and managed by the Division of State Lands. Columbia County owns a small parcel of land within the 110 acres and approximately 60 acres is leased by a local sand quarry operation, BC Excavation (no author 2003).

LST-1166 is moored to the bank south of the vessel. This shoreline contains forested river banks, wetlands and open farmlands. Several farms are located within one mile of the vessel with the closest farm within 1/4-mile. Lord Island, located north of LST-1166, primarily consists of wetland and forested land. LST-1166 is bordered east and west by the Columbia River (EPA 2010b).

LST-1166 is located in a semi-remote part of the river; however, this area is extensively used by the public for fishing and is downstream from a public access beach. The land in the immediate vicinity of the LST-1166 is used both for recreation and industrial purposes (EPA 2010).

The closest city to LST-1166 is Longview, Washington in Cowlitz County, an industrial port city which has a population of approximately 36,767 (USCB 2006). LST-1166 is located approximately 1.5 miles across and down river from Longview. Rainier, Washington, a small rural community with a population of 1,687 is also nearby, but located approximately 4.5 miles upstream and southeast of LST1166.

#### **1.1.4 Sensitive Ecosystems**

The Columbia River supports a wide array of fish, wildlife and sensitive environments. No officially designated wilderness areas or wildlife preserves are located in the vicinity of the vessel; however, several species have been listed as endangered for Columbia County and may be found in the vicinity of the vessel (EDR 2011).

The upper, middle, and lower Columbia River populations of Steelhead (*Oncorhynchus mykiss*); the upper and lower Columbia River populations of Chinook salmon (*Oncorhynchus tshawytscha*); and, the Columbia River population of Chum salmon (*Oncorhynchus keta*) have been federally-listed as endangered species (EDR 2011). On the state-level, the river has been designated as critical habitat for Bull Trout (*Salvelinus confluentus*) and Steelhead (*Oncorhynchus mykiss*), and is a migratory pathway crucial for the maintenance of Steelhead (*Oncorhynchus mykiss*) (WA DEP 2003). In addition, the Northern Spotted owl (*Strix occidentalis caurina*), and Columbian White-tailed deer (*Odocoileus virginianus leucurus*) have been federally-listed as endangered species for Columbia County (EDR 2011). The Bald eagle (*Haliaeetus leucocephalus*) is protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Lord Island, located north of LST-1166, is designated as a waterfowl use area and wetland habitat (WA DEP 2003). Both Riverine and Palustrine wetland systems are located in the vicinity of the vessel (EDR 2011).

#### **1.1.5 Meteorology**

The average temperature for the area ranges from 45 degrees Fahrenheit (°F) in the winter months to 76°F in the summer months with an annual average precipitation of 46.17". Wind conditions are generally less than 15 miles per hour (mph) with gusts to 20 mph. (NOAA *undated*).

### **1.2 Previous Removal Actions and Investigations**

#### **1.2.1 United States Coast Guard**

On September 7, 2007, the United States Coast Guard (USCG) was notified by local law enforcement authorities that oil was discharging from the LST-1166 into the Columbia River. The USCG immediately conducted an inspection of the ship and confirmed there was a substantial threat of discharge of fuel oil and hazardous substances, due to the deteriorated

condition of the vessel. Further investigation revealed that the cause of the sheen was a result of thieves stripping the piping, valves, electrical wire, and hydraulic lines. The evidence of vandalism and theft was documented during this inspection. During the investigation, the USCG discovered lubricants, solvents, potential asbestos-containing materials (ACM), and lead-based paint on and in the vessel.

On November 13, 2007, the USCG issued an Administrative Order (Order) to the vessel owner, USS Washtenaw County – LST1166, LLC, to remove all contaminants from the vessel. The owner held a COFR, which was issued because the vessel operator had demonstrated their ability to pay for cleanup and damage costs in the event of a water pollution incident under the Oil Pollution Act (OPA). The COFR was underwritten by Lloyds of London, who hired a contractor to respond to the Order.

On January 15, 2008, the USCG, granted the COFR's contractor additional time to remove oils and to pursue disposing of the vessel under the 40 CFR § 229.3 for vessel disposal under the Marine Protection, Research, and Sanctuaries Act (MPRSA). On February 1, 2008, Region 10's Ocean Dumping program received a request from the underwriter's contractor seeking authorization to use the EPA Ocean Dumping General Permit (ODGP) for vessels to dispose of the LST-1166 at sea. However, on February 15, 2008, the contractor was denied permission because the terms of the ODGP had not been met. The contaminants on the vessel had not been removed to the maximum extent practicable, as required. Following dissolution of LLC, the underwriters discontinued efforts to comply with the USCG orders.

USCG, in response to the owner's non-compliance with the Order, conducted interim removal activities from July 2008 to January 2009. The materials removed and disposed of during the Removal Action are summarized below in [Table 1.2.1](#).

**Table 1.2.1: Removal Action Disposal Summary**

<b>Total</b>	<b>Unit</b>	<b>Material Description</b>	<b>Disposal Facility</b>
3,975	Gallons	fuel and oil	ORRICO (Oil Re-refining Co.) Portland, OR
8,100	Pounds	oily debris	Hillsboro Landfill Hillsboro, OR
26,342	Gallons	oily water	ORRICO (Oil Re-refining Co.) Portland, OR

465,800	Gallons	Water from lower decks treated with carbon filter media and discharged to the Columbia River. Filter media disposed of at Hillsboro, OR landfill.	Hillsboro Landfill Hillsboro, OR
5,125	Gallons	Polychlorinated biphenyl (PCB) oil from forward hydraulics and piping	Burlington Environmental LLC Kent, WA
349,442	Pounds	PCB-contaminated solids*	Waste Management, Arlington, OR
5	Pounds	Mercury	Burlington Environmental LLC Kent, WA
4	Pounds	hypodermic needles	Stericycle Kent, WA
120	cubic yards	friable asbestos	Waste Management, Arlington, OR

\*Light ballasts transformers, electrical equipment and other solids in contact with PCB oils.

In addition to removal of the preceding quantities of materials, the remaining insulation, surfaces, and piping that contained asbestos were encapsulated (USCG *undated*).

Funding for the USCG Removal Action included \$4,784,283 from the Oil Spill Liability Trust Fund (OSLTF) and \$137,036 from the Superfund (USCG 2009). During the Removal Action, the USCG hired armed security guards in an attempt to keep vandals and drug users off the vessel.

In January 2010, the USCG contacted EPA's Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program and informed EPA of the USCG's intent to use the ODGP to dispose of the vessel in the ocean or turn control of the vessel over to EPA for a Remedial Action. This contact initiated EPA's integrated involvement with the investigations and actions concerning the LST-1166 l under the CERCLA, Ocean Dumping Act and TSCA programs.

### 1.2.2 U.S. EPA

In late 2007, EPA's ocean dumping program was first contacted by the COFR's contractor about disposal of the LST-1166 in ocean waters. At the time of the contractor's written request to dispose of the vessel in the ocean in 2008, EPA's ocean program determined the vessel did not meet the criteria for ocean disposal and informed the contractor that additional work was necessary. The COFR decided not to undertake work. The USCG undertook to remove some of the contaminants from the vessel when the COFR stopped all work. In 2009, the USCG asked EPA to consider whether the criteria for ocean disposal had been satisfied. EPA's ocean program found that additional work was still needed and EPA's TSCA program expressed concern over PCBs on and in the vessel. EPA's removal program began working with the USCG, and in March 2010, EPA conducted two inspections of the LST-1166. During these inspections, EPA personnel observed heavily corroding and flaking paint throughout the interior of the vessel. Corrosion was also evident on the exterior of the vessel. Paint chips were observed littering most of the horizontal surfaces and deck floors. There appeared to be the potential for paint to flake off the external surfaces of the hull and fall into the Columbia River if the hull were to come into contact with an abrasive force. In addition, an unknown type of oil was observed floating atop the waters that had flooded the lower decks of the vessel, which was estimated at a depth of 20 feet.

### 1.3 Source, Nature, and Extent of Contamination

During inspections conducted by EPA in January and March 2010, painted surfaces throughout the interior and exterior of the vessel were observed to be corroding and flaking, with paint chips littering most horizontal surfaces and deck floors (Photographs [4](#) and [5](#)). In addition, there was the potential for paint flaking off of external surfaces and the hull to fall into the Columbia River; however this appeared unlikely without some abrasive force. Correspondence between USCG and EPA confirmed that the interior paint contained both lead and PCBs, while the exterior paint contained only lead. On October 9, 2008, Crescere Marine Engineering, Inc. conducted an estimate of total surface area for paint removal from the vessel. The total paint removal area, including all interior and exterior areas of the vessel, was estimated at 519,456.5 square feet. The total paint removal area, excluding the exterior of the vessel, was estimated at 447,337.8 square feet.

Through correspondence with the USCG, EPA confirmed that the wiring was of an age where asbestos-insulation and PCBs would be expected. Most of the easily accessible wiring in the vessel was removed by scavengers for the recyclable copper content. However, there remains a significant amount of wiring left onboard the vessel in runs along bulkheads and overheads. Using materials models from the Navy's Ex-Oriskany reports, the total estimated weight of wiring remaining onboard the LST-1166 is 14,850 lbs, which includes an estimated copper weight of 3,519 lbs, and insulation only weight at 10,730 lbs (Pape 2004). During the recent USCG Removal Action (conducted in 2008 and 2009), the electrical wiring insulation that remains was tested and found to contain concentrations of PCB that range from <0.50 milligrams per kilogram parts per million (ppm) to 2,160 ppm (Cowlitz Clean Sweep 2009). Also during the Removal Action, insulation, surfaces, and piping that contained friable asbestos were encapsulated. This encapsulated material was observed by EPA on board the vessel in 2010 and was estimated to be approximately 80 cubic yards in volume. In addition, non-friable and intact asbestos flooring was present in the mess hall of the vessel.

During the previous removal action, the contractor for USCG observed that bulkhead and/or overhead insulation was present, but was believed to be limited to the rooms in the superstructure and not below deck (Personal Communication, Cowlitz Clean Sweep). Using visual observation only, it is estimated that there is approximately 1600 square feet of overhead space in the vessel's superstructure which may contain PCB-contaminated insulation (including coverings and resins). It is common knowledge that such materials exist in Navy vessels of this age, and these materials have been known to hold some of the highest levels of PCBs on these ships (Pape 2004, PEO Ships 2006).

In 2010, EPA observed that several rooms and interior spaces in the vessel were completely filled with foam. Since inspection of these rooms is not possible without removal of foam, it is unclear whether PCB-based paint and/or PCB-contaminated electrical wiring exists in foam-filled rooms. Correspondence between the USCG and EPA, as well as ships diagrams confirmed that the vessel was "filled" with polyurethane foam. The area of the foam was estimated to be 375 feet in length, 75 feet in width, and between 12 to 14 feet in depth. The foam was reported to be closed cell in nature and all tests reported that there was no contamination in the foam. It was reported that areas of the foam in one room were breached by vandals and had a small amount of asbestos contamination; however, those areas were removed during the USCG's cleanup efforts.

Finally, during the previous EPA inspection, EPA observed an oily substance floating on the surface of approximately 20 feet of water in a limited viewing of an area of a lower deck of the vessel (the deck immediately below the main cargo deck). The flooding occurred during

breakage of a seal during the USCG's Removal Action in 2008-2009. The extent and volume of oil throughout the lower decks is unknown but assumed to be small. No samples have been collected to characterize this water.

### **1.3.1 Analytical Data**

During the Removal Action by the USCG in 2008-2009 (see Section 1.2.1 above), USCG's contractor collected multi-media samples from the vessel. The sampling event included: collection of water for metals and PCBs analysis; collection of paint chips for metals and PCBs analysis; and collection of solids and/or oil for metals and PCBs analysis. During the removal action, the ballast water, oils, and PCB-contaminated solids mentioned in Table 1.3.1 below were removed. All of the analytical data from the sampling event was reviewed by the EPA and its contractors. Concentration ranges for the constituents of potential concern (COPC), notably lead and PCBs, in all of the sampling media are summarized in [Table 1.3.1](#). Hard copies of the data are available as part of the Administrative Record held by the USCG.

**Table 1.3.1: 2008/2009 Removal Sample Results for COPCs**

Physical Location of Sample	Medium/Status	Analytical Result
Starboard side of the Tank Stowage Deck	Ballast tank water	Lead 182 µg/L
Green paint taken from Pilot House walls	Flake sample of paint	Lead 8200 mg/kg
White Paint Rib 56	Flake sample of paint	Lead 71500 mg/kg
Stern Floor – Starboard	Oil on floor	PCB 5120 µg/wipe
Front Port Hydraulic Equipment	Hydraulic oil	PCB 4360 µg/L
Ceiling of Flag Officers Room	Electrical wiring	PCB 2160 mg/kg
Portside Bow Oil	PCB contaminated solids	PCB 361 mg/kg
Captains State Room	Electrical wiring	PCB 72.6 mg/kg

### 1.3.2 Contaminants of Potential Concerns

Following EPA's assessments that were conducted in January and March 2010, it was confirmed that contamination remains on board the vessel, including PCBs in interior paint and paint chip debris, lead-based paint chip debris, PCBs in electrical wiring insulation and fuel/oil globules and minor sheens on the lower-deck water. Samples were collected from flaking paint on the exterior and interior of the vessel. Samples were also collected from the wiring insulation and encapsulated asbestos-containing materials. Sample results confirmed that lead was present in the interior and exterior paint ranging from 3.42 ppm to 71,500 ppm, PCBs were present in the interior paint ranging from <0.5 ppm to 72.6 ppm, and PCBs were present in the asbestos wrapped wiring insulation ranging from <0.5 ppm to 2,160 ppm. Paint chips, regardless of their

composition are considered a COPC because of the ocean dumping permit requirements<sup>7</sup> of no visible debris at the time of scuttling. No samples have been collected to characterize the lower decks water. Trace amounts of globules and sheens of oil observed floating on the water of the lower deck will be removed and disposed of properly when the ship is dewatered and at that point will no longer present a threat to human health and the environment. [Table 1.3.2](#) summarizes the COPCs and the estimated volume of the materials:

**Table 1.3.2: Potential Sources of Contamination**

COPC	Concentration Levels	Estimated Area/Volume
asbestos (sealed)	N/A	80 cubic yards
asbestos flooring (non-friable)	N/A	Mess Hall only; exact volume unknown
Lead-Based Paint <sup>1</sup>	3.42 to 71,500 mg/kg	507,455.8 square feet <sup>2</sup>
PCBs-laced, asbestos Wiring insulation	<0.5 to 2,160 mg/kg	10,730 pounds insulation
PCB paint	<0.5 to 72.6 mg/kg	12,000 square feet
Fuel/Oil	Unknown - Only non-oily water is currently present in the lower decks. However, the water may contain dissolved petroleum contamination.	Unknown; Approximately 500,000 gallons of non-oily water is currently present in the lower decks.

<sup>1</sup> Estimated volume of lead based paint chip debris in the interior of LST 1166 is 600 pounds.

## 1.4 Streamlined Risk Evaluation

This streamlined risk evaluation for the vessel was prepared using the general guidance provided in EPA's *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (EPA 1993). This risk evaluation is intermediate in scope between limited evaluation conducted for emergency removal actions and the conventional baseline assessment normally conducted for remedial actions.

The purpose of this evaluation is to identify the COPCs using sampling data from the vessel, provide an estimate of how and to what extent humans and ecological receptors may be exposed to these chemicals, and qualitatively evaluate the health effects associated with the COPCs.

This streamlined risk evaluation addresses the removal action objective of protecting human health and the environment from exposure to: 1) lead-based paint chip debris, 2) PCB containing paint, 3) PCB containing, asbestos wrapped electrical wiring, 4) potentially friable ACM in the LST 1166, and 5) Globules and Sheen of Fuel/Oil.

- The total painted surface area aboard the LST-1166 is approximately 507,455 square feet. Lead concentrations in the lead-based painted surfaces ranged from non-detect to 71,500 ppm.
- Approximately 12,000 square feet of painted surface involves paint containing PCB in concentrations ranging between < 0.5 ppm to 72.6 ppm PCBs. Assuming an estimate of 200 square feet/gallon coverage of paint and assuming an average PCB concentration in the paint to be 50 ppm, it is estimated that the maximum total mass of PCBs in the paint on the LST-1166 is approximately 550 grams (Yender 2009).
- Most of the easily accessible wiring in the vessel has been removed by scavengers for the recyclable copper content. The electrical wiring that remains (approximately 14,850 pounds remain on board, 10,730 pounds of which is estimated to be PCB-laced asbestos insulation) contains concentrations of PCB that range from <0.50 mg/kg to 2,160 ppm, however the bioavailability potential is much lower than the PCB paint, because organisms would have to ingest the paint chips.
- The volume of ACM was not quantified (e.g., floor tile, insulation, etc.) but is reported to be in non-friable condition (USCG 2009), friable ACM has been removed or encapsulated. Some of the wiring consists of copper wire wrapped in asbestos which is impregnated with PCB. The wire and wrapping is jacketed in a protective, braded cover and further covered by multiple layers of paint. The PCB and asbestos is not readily available to human health or the environment ([Photo 6](#)).

Substances found on LST-1166, including the substances discussed the preceding section, constitute hazardous substances as defined by Section 101(14) of CERCLA, 42 U.S.C. §9601(14). Oils present and discharged from LST-1166, also discussed in the preceding section, meet the definition of “oil” and “discharge” as defined in Sections 311(a)(1) and (2) of the Clean Water Act (CWA), 33 U.S.C. §1321(a)(1) and (2) and Sections 100(23) and (7) of the OPA, 33 U.S.C. §2701(23) AND (7). Disposal of PCBs is also regulated by the Toxic Substance Control Act (TSCA), 40 CFR Part 761 Subpart D.

This streamlined risk evaluation for the vessel assumes any hazardous substances with COPCs pose an actual or potential threat to human health or welfare, or the environment. Previous investigations have adequately defined the extent of the COPCs that are present in source materials to proceed with this EE/CA.

#### **1.4.1 Degradation of Water Quality in the Columbia River**

Preparation of the vessel for berthing in place or transport for disposal, and actual transport of the vessel will have no effect to the listed or proposed resources because there will be no impacts, positive or negative. Best management practices will be applied to all in-water work preparing the hull and all other preparatory activities will be confined to top deck and internal confines of the vessel.

Currently, the lower two decks of the vessel are flooded due to a leaking seal(s), but the vessel is still floating two feet above the riverbed (at low tide) in 20 feet of water. The process for improving the floating of the vessel and making the vessel towable will involve underwater repair of the seal(s) by divers and then pumping the water out of the vessel. The water in the vessel will be pumped to a granulated activated carbon filtration treatment unit prior to discharge to the river to remove any potential oil or other contaminants. The treated water will meet water quality discharge requirements. The vessel contains approximately 500,000 gallons of water and the pumping rate is expected to average 50 gallons per minute. At that rate, it will take approximately two weeks to drain the vessel and it is estimated that the vessel will rise in the river at a rate of about 0.6 inches per hour. The lifting rate will be imperceptible compared to the velocity of the river’s flow and will not result in any measurable turbidity in the water column or affect sediments on the river bed. Transport of the vessel to an ocean disposal site or Portland Harbor for ship breaking will have no effects as it would be no different and any other vessel in tow.

#### 1.4.2 Release of Paint Chips and Oils from Vessel

Threats from exposure to contaminants on board the vessel are present for human receptors. The threats are limited to trespassers and potential workers. The elevated concentration of hazardous substances and exposure of contaminated surfaces or lead dust to the environment, as well as potential vapors from oil indicates that inhalation and ingestion exposure pathways potentially exist. Trespassers could be exposed to the contaminants. In the event of future recycling activities workers may have occupational exposure. The cleanup level for lead dust on floors is 40 micrograms per square foot ( $\mu\text{g}/\text{ft}^2$ ) (EPA 2001). Other pathways (e.g., soil, surface water, sediment, ground water) are not complete for human health. Threats to recreationists do not exist because the pathway to the interior of the vessel is incomplete and there are not threats of exposure associated with the exterior (hull) of the vessel.

As the vessel deteriorates, chips of lead-based paint on the exterior of the ship may occasionally flake off the hull and superstructure and drop into the river. Anti-fouling (AF) coatings typically are not of concern on vessels that are at least twelve years old and since all the underwater hull area is covered with marine growth, any AF coatings can be left in place without further evaluation, as they are no longer likely to be harmful as indicated by EPA guidance (EPA, 2006). Exterior paint chips containing lead from degraded surfaces, may accumulate in sediments and be ingested by fish or benthic organisms. Indirect exposure may occur through bioaccumulation in the food chain and trophic transfer to avian omnivores, avian piscivores, or wildlife that consumes fish or benthic organisms. However, the high flow rates transport the chips an unknown distance downstream before they are deposited on the sediment. The distance from the vessel is partially controlled by the chip size and water velocity. The USGS measures the annual discharge for the Columbia River at The Dalles, Oregon at River Mile 194. The average annual discharge for 1879-1999 was 86,175,360 gallons per minute. Sand transport in the lower Columbia River is driven by the river discharges. Annually, the lower Columbia River sand transport is highly variable ranging from approximately 0.1 million cubic yards (mcy) in 1926 to over 37 mcy in 1984. Since 1975, the average annual sand transport is about 1.3-mcy/yr (USACE undated). Therefore, based on the environment surrounding the vessel, the accumulation of significant lead-based paint chips in sediments is improbable. Given the random flaking of the exterior paint from the hull, high flow rates and high sedimentation rates in the river, the possibility that paint chips could accumulate in sediment at concentrations presenting a threat to listed or proposed resources is highly unlikely.

At the proposed ocean disposal location, approximately 1,000 fathoms (6000 feet) below the surface of the ocean, there are no human receptors and impacts to any ecological receptors from lead in paint chips are not anticipated. The contamination remaining in the vessel will have

minimal impact on the environment based on human health and ecological risk assessments conducted obtained from studies conducted on vessels disposed in shallow reef environments. These studies indicate the fate and transport of lead in paint will not likely leach to the environment under the prevailing pressure, temperature and salinity (Yender 2009), (U.S. Navy Fact Sheet 2011), (PEO Ships 2006a). Therefore, this alternative will have no impact on any potential receptors and is likely more protective for the LST-1166 disposal since the vessel will be scuttled at a depth significantly greater than the shallow reef for which the human health and ecological risk assessments were conducted.

It should be noted that the USCG removed the oils and lubricant from the vessel during an earlier removal action, thereby eliminating potential exposures of biota to these wastes. Further, the proposed ocean disposal location was previously ~~approved~~ reviewed and the location is sited in an areas that would reduce the exposure potential to human and ecological receptors; as a result, the proposed disposal location ~~would not be located in; is free of:~~

- shipping lanes; designated marine sanctuaries, or any location where the hulk may present a hazard to commercial trawling or national defense;
- restricted military areas;
- areas of poor water quality (e.g., low dissolved oxygen, dredged material disposal sites);
- traditional trawling grounds;
- areas of unstable seafloor bottoms;
- areas with extreme currents, or high wave energy;
- existing right-of-ways (e.g., oil and gas pipelines and telecommunication cables);
- sites ~~for purposes that are incompatible with~~ suitable for artificial reef development; ~~and/or~~
- areas designated as habitat areas of particular concern or special aquatic sites.

#### 1.4.3 Leaching of Chemicals into the Columbia River and the Pacific Ocean

PCBs were historically used in hundreds of industrial and commercial applications until their manufacture was banned in the US in 1979 (EPA, 2010). ~~When released in the environment,~~ PCBs do not readily break down and therefore may remain for long periods of time cycling between air, water, and soil (EPA, 2010). As a result, PCBs can be carried long distances and have been found in snow and sea water in areas far away from where they were released into the environment. As a consequence, PCBs are found all over the world (EPA, 2010). The leaching of chemicals such as lead and PCBs from the LST-1166 into the Columbia River and the Pacific Ocean are of particular concern since lead and PCBs are known to bio accumulate in organisms and can be transferred through the food chain. Although studies have shown that chemicals, such as heavy metals and PCBs, have a wide-spread presence in fish and shellfish, ecological

distributions of chemical concentrations are often not correlated and can be species-specific, suggesting that there are other factors that influence the presence of chemicals in biota (Johnston et al., 2007; Snyder and Karouna-Renier, 2009). These factors may include life history, bioavailability, spatial dispersion of chemicals, and from sources other than the vessels due to the widespread use of both PCBs and lead in industrial operations and components of fuel and oil products.

Investigations of solid materials found onboard older, out of service surface vessels and submarines have been conducted to evaluate the leaching of PCBs found in shipboard components (George, et al. 2006; Johnston, et al., 2006). Leaching experiments were designed to simulate an open system with transport of PCBs away from the solid to preclude PCB saturation in seawater. Results of the studies demonstrated that various shipboard solids attenuate the leaching of PCB to varying degrees and eventually stabilize at significantly different rates. For the former USS Oriskany, used to create an artificial reef off the coast of Pensacola, Florida, the leach rate of PCBs from bulkhead insulation was determined to leach proportionally more PCBs than the other materials. In contrast, electrical cabling has a very low leach rate and contributed only about 10% of the PCBs expected to be released at steady state (Johnston, et al., 2006).

In the same study, Johnston, et al. (2006) estimated future risks from sinking the former USS Oriskany, using a prospective risk model (PRAM, NEHC/SSC-SD 2006a) and a time dynamic model (TDM, NEHC/SSC-SD 2006b) developed to model the release, transport, fate, and bioaccumulation of PCBs leached from solid materials onboard the vessel. The results of the models were used to characterize potential toxicological risk from PCBs to ecological receptors that could reside, feed, and/or forage at the artificial reef. The risk characterization indicated that predicted sediment and water concentrations around the reef showed no indication of risk during the first two years after sinking or in subsequent years. Total PCB exposure levels predicted by the models showed no indication of risk to plants, invertebrates, fishes, sea turtles, and sharks/barracudas that could live, feed, and forage on the reef. The no-effect threshold for total PCB was exceeded for dietary exposure to dolphins, cormorants, and herring gulls, indicating risk, however, it was conservatively assumed that these species would be life-long residents of the reef and would obtain 100 percent (%) of their food requirements from the reef. Thus, it is likely that actual exposures would be much lower. The predominant route of exposure and trophic transfer of PCBs in the food web was through contact with elevated PCB concentrations modeled for the internal vessel water.

Another study involved a screening level ecological risk assessment conducted using data from fish species collected at artificial reefs comprised of decommissioned ships (Johnston, et al., 2003) in shallow waters to evaluate potential exposures to the reef community and indirect

exposures through the food chain. Results indicated that tissue residue data for PCBs, lead, and cadmium in tissues of fish and PCBs and lead in invertebrates were higher in samples from the Navy ship reefs than reference reefs. However, most of the tissue data were lower than effects levels for the reef community, suggesting that there was negligible to low risk of exposure to demersal fish and reef invertebrates. For food chain receptors, data from chemical concentrations in prey were below dietary benchmarks, suggesting that there is a low risk of exposure to dolphins and piscivorous birds, and negligible risk of exposure to diving birds. In addition, empirical estimates of PCB leaching rates were used to simulate the leaching of PCBs from one of the ships and to estimate the instantaneous steady state concentration of total PCBs around the ship. The estimated concentrations were compared to PCB water benchmarks and multiplied by bioconcentration factors to estimate the resulting PCB concentration in fish and shellfish. Results indicated that there was negligible risk of exceeding water column or tissue benchmarks for the scenarios evaluated. The investigators concluded that based on findings of negligible to low risk of exposure to PCBs, the creation of artificial reefs with former Navy vessels containing residual PCBs in solid materials does not pose an unacceptable risk in the environment.

While studies on the former USS Oriskany and other ships provide information on release and fate of PCBs in a shallow water environment, a different set of variables affects the fate and transport of PCBs in a deep ocean environment (PEO, 2006b.).

- a. **Deep Ocean Ecosystems.** The ocean bottom acts as a trap for sinking and re-suspended particles and supports a higher level of metabolic activity than the water immediately above. Biomass for deep-ocean benthos is relatively low in comparison with typical biomass found for shallow coastal regions. In the deep, open ocean, the benthic microfaunal biomass is dominated by filter and deposit feeding organism's mainly consuming settled detritus and carrion. Due to the lack of sunlight or photo-energy sources, plants are non-existent and food for larger predatory vertebrates (e.g. fish) is presumed to be less available than in a littoral environment. -Eventually reefs are created from hulks although in the deep ocean, the process may take from years to decades in contrast to the relatively fast establishment of ecosystems at shallow depths. The benthic infaunal community is considered the most important ecological community at risk from contaminants related to the hulk. The impacts from the hulk may potentially affect infaunal communities because of reef effects (the physical presence of the large hard surface structure) and contaminant effects (release of chemicals from the hulk). These changes can result in physical disruption of the habitat, alteration of trophic and biological relationships, and/or the presence of chemicals from the hulk. -Both natural and artificial reef structures can significantly affect adjacent soft-bottom communities by altering bottom boundary currents, affecting food supply and changes in sediment grain

size and providing habitat for predators that forage on the infauna near the reef, however, this is temporary and over time habitats and ecological communities become re-established

- b. **Chemical and Physical Characteristics of PCBs.** Physical chemistry data on PCBs vary but generally PCB aqueous solubilities decrease with increasing level of chlorination (higher molecular weight congeners). Solubility of PCBs has been demonstrated to be five times lower in seawater than corresponding values in distilled water. Additionally solubility of different PCB isomers can vary widely (Dexter and Pavlou, 1978) and solubility can increase exponentially with increasing temperature. Extrapolation of the data to estimate solubilities at deep sea temperatures of 4°C are much lower and range between 0.2 ppb and 1.2 ppb, depending on the isomer, in contrast to predicted solubilities ranging from 6 ppb (Aroclor 1268) to 34 ppb (Aroclor 1254), (Dickhut et al., 1986; Shiu et al., 1997).

Adsorption and desorption rates of PCBs in the ocean environment are dependent on the PCB mixture and substrata to a great extent. PCBs tend to quickly bind to sediment, once released into an aqueous environment as demonstrated by using clays and natural lake sediments (Di Toro and Horzempa, 1982). The study concluded that sediment-adsorbed PCB fractions may be comprised of both reversibly and permanently bound components but mainly remain bound to sediments.

- c. **Biodegradation and Transformation.** It is generally assumed that the photo-degradation rate of PCBs in water is about one-tenth of the photo-degradation rate in the atmosphere (Sinkkonen and Paasivirta, 2000). There is a weak association between temperature and photo-degradation rate of organic compounds in solution. However, an increase in temperature by 10°C may result in a corresponding increase in the biodegradation rate by a factor of 2.2 or as much as 2.5 to 3 (Sinkkonen and Paasivirta, 2000) and decreased degradation may occur with a decrease in temperature. Estimates of biodegradation half-lives for PCBs in sediments and soils vary from several years to decades. Half-lives for different congeners have been reported on the order of 10 to 20 years although the rate and extent of degradation is highly site-specific and dependent on factors such as initial PCB concentrations, depth, temperature, other contaminant species, and nutrients present. Another study (Williams and May, 1997) has shown that microbial aerobic degradation of sediments from the Hudson River spiked with Aroclor 1242 can occur at temperatures as low as 4°C within six weeks. This suggests that degradation at such low temperatures is possible in a deep ocean environment although more slowly than in warmer waters.

A study of ecological impacts from deep ocean disposal has been conducted for the ex-AGERHOLM, a World War II-era destroyer sunk in the deep ocean during training and weapons testing as part of the Navy's deep water sinking exercise (SINKEX) in June 1982 (PEO Ships, 2006b). The vessel is sunk in 2,750 feet of water about 120 nautical miles off the coast of San Diego, California. Although the ex-AGERHOLM represents a single sunken ship, the site is considered representative of the types of ships of that class, age, and degree of preparation used as expendable targets in the pre-1990 SINKEX program. The ex-AGERHOLM was investigated to assess ecological impacts to the deep-sea benthic, epibenthic, and pelagic receptors at the site to meet the regulatory requirements identified by the U.S. EPA for conducting SINKEX missions in deep water off the continental shelf. The study was based on an extensive literature review, PCB leach rate study, and field investigation using multiple lines of evidence to determine if potential contaminants of concern: 1) were released from the representative sunken naval vessel, and if so, 2) whether they have adversely impacted the adjacent marine environment. In addition to PCBs, the study also investigated metals and polycyclic aromatic hydrocarbons (PAHs). The ex-AGERHOLM is the only deep-water site with known PCB source data that has been studied to date.

Primary lines of evidence in the ex-AGERHOLM study were: 1) PCB chemistry in sediments comparing the PCB concentrations in the areas in the vicinity of the sunken hulk compared to reference sites; 2) sediment acute and chronic toxicity bioassays, and 3) sediment bioaccumulation analyses. Results of the sediment chemistry sampling indicated that although the PCB concentrations were about twice as high as PCB concentrations measured from reference samples, the differences were not statistically significant and all sediment PCB concentrations were below the Effects Range-Low (ERL), the concentration of a chemical below which adverse biological effects are rarely observed. Sediment toxicity tests showed that amphipod survival tests resulted in survival values of 83% for the ship site and 93% for the reference site. Since biological significance was defined as greater than 20% reduction in survival relative to controls (USEPA/USACE 1991), the result was considered "not significant". Results of *Neanthes* (worm) chronic 28-day survival and growth tests also did not show statistically significant differences between the ship site and reference sites. The potential for PCBs to accumulate in the food chain was conducted using bioaccumulation tests for the *Macoma* (clam) and *Nephtys* (worm). There were no statistical differences at the  $p < 0.05$  levels for *Macoma* or *Nephtys* when data were compared from the ship site and the reference locations. However, at one particular station near the ship's stern, the highest PCB concentrations for both *Macoma* and *Nephtys* were notably elevated.

Additional lines of evidence used in the ex-AGERHOLM investigation were evaluated to more completely assess potential risks at the site. These additional lines of evidence included a benthic community analysis, evaluation of secondary chemicals of concern – metals and PAHs;

and, an evaluation of the spatial distribution of PCBs. There were no statistically significant difference in measures of diversity, richness, and abundance between the ship site and the reference site, indicating that the communities were comparable. Differences in major taxonomic groups between the two sites were correlated with differences in sediment (grain size and total organic carbon). Cadmium, copper, nickel, and silver were present in the sediments. Cadmium was shown to bio accumulate in both the *Macoma* and *Nephtys*; copper bio accumulated in *Macoma* but not in *Nephtys*; and silver bio accumulated in *Nephtys* but not *Macoma*. The study of spatial distribution of PCBs indicated that the highest chemical concentrations and evidence of negative biological response ~~were~~ observed at stations that clustered near a large break in the hull at the rear of the ship, however, no statistically significant correlations were found. Investigators hypothesized that more chemical contaminants were released from the break in the ship and were deposited into sediments after the ship settled on the ocean bottom, resulting in an increase in exposed surface area inside of the hull for leaching and/or particulate transfer of contaminants from shipboard materials to the environment. However, the results suggest that PCBs and other contaminants released from the vessel were localized and confined to areas within the immediate vicinity of the ship.

Further, based on the deep sea study with the ex-AGERHOLM, bottom water currents were determined to be minimal and likely do not contribute to the large scale movement of sediments. The study indicated that due to the presence of very low energy bottom currents relative to the dynamics associated with sorption and settling that would cause deposition into the sediments after any release of dissolved PCBs into the water column, any contaminants originating from the ex-AGERHOLM are not expected to differentially ~~accumulative~~ accumulate with directionality in the near hull sediments (PEO, 2006b).

Tissues from sablefish were also sampled from the ex-AGERHOLM site and from reference locations four nautical miles away from the ship. Results of the testing showed that the sablefish from the ex-AGERHOLM had statistically higher concentrations (by a factor of 1.4 to 1.5) of PCBs than the sablefish from the reference area. Tissue residue benchmarks were developed to evaluate potential effects from exposure to Total PCBs and were based on the tissue screening value (TSV), bioaccumulation critical value (BCV), and critical body residues (CBRs), which are chemical residue thresholds at or below which adverse toxicological effects would not be expected. Total PCBs in sablefish from the ship site were significantly higher than reference and three samples from the ship sites exceeded the most conservative benchmark (TSV) used in the analyses, however, no sample exceeded any of the less conservative benchmarks.. These results suggested that it was unlikely that exposure would be harmful to the deep sea pelagic community as a whole and there would be negligible risk to individual sablefish from critical body residues of Total PCBs.

In support of the ex-AGERHOLM findings, studies have shown that PCB bio-magnification through the food chain may not occur due to factors such as feeding strategies, biochemical adaptations to depth, and differences in lipid and lipid types. Also, lower food chain levels (plankton and invertebrates consumed by fish) do not biomagnify to the extent observed in upper food chain species such as mammals and birds (Harding, 1986; Shaw and Connell, 1982). Consumption of contaminated food is the major source of chemicals for predatory birds and mammals. In contrast, the direct uptake of chemicals from water, sediment, and air is minor in comparison for upper food chain species (Nendza et al., 1997).

It should also be noted that since 1990, SINKEX ships have been more extensively cleaned, particularly for PCBs. Therefore the ex-AGERHOLM likely contained more PCBs-in solid materials (PCBs-ISM) than ships sunk after 1998 and it is likely that more recent SINKEX vessels will likely pose less risk from PCBs-ISM. Based on studies of the impacts of decommissioned vessels for the creation of artificial reefs in shallow water and the data generated for the ex-AGERHOLM in the deep ocean, is not expected that the removal and transport of LST-1166 from the Columbia River will affect any endangered, threatened, or special status species identified in the project area or result in long-term effects on benthic or pelagic communities in the vicinity of the disposal site.

#### **1.4.3 Conceptual Site Model**

LST 1166 is moored on the banks of the Columbia River. The vessel's hull has been compromised; it is in hydraulic communication with the river, resulting in flooding of the lower two decks. The USCG previously removed most all oils and lubricants, with exception of the oil observed floating on a flooded deck. The vessel is deteriorating. Interior paint is peeling and flaking to the interior deck floors. Exterior lead-based paint has the potential to flake into the river. Water in the flooded levels of the vessel is in contact with lead-based paint, PCB-containing paint and electrical wiring. ACM which remains in the vessel is not currently friable.

The risk evaluation concludes that trespassers and potential future occupational workers may potentially have inhalation, ingestion and dermal exposures, but that other human pathways are incomplete. The risk evaluation concludes that there are unlikely any complete pathways for ecological exposure.

#### **1.4.4 Uncertainty Analysis**

ACM on board is not currently in a friable state and could change, although this is unexpected. PCBs in paint are bound in the matrix of the paint solid structure and, as such, are not available

in a form that would expose or be bioavailable to marine organisms. Furthermore, it is unlikely that trespassers or workers would purposely or accidentally ingest paint chips, especially if they are following health and safety protocols. It is more likely that inhalation of contaminated dust particles may occur, but it is unlikely that the respirable fraction of dust particles would be less than PM 2.5. Based on the research developed in the streamlined risk evaluation above, we have determined that the proposed project will have no effect on the species and critical habitat identified in Section 4.0 during the removal and transportation elements of the action or on the deep water benthic and pelagic communities at the proposed disposal site.

## **2.0 IDENTIFICATION OF REMOVAL ACTION SCOPE, GOALS, AND OBJECTIVES**

This section presents the objective(s) for the proposed removal action. The purpose, scope, and scheduling requirements for implementation of the removal action alternatives are also described in this section in order to define removal action requirements based on time, budget, technical feasibility, and relevant criteria and standards.

### **2.1 Statutory Limits on Removal Actions**

CERCLA Section 104(c)(1) set limits of \$2 million and 12 months for Fund-financed removal actions. Cost and implementation time exemptions may be granted if the USCG determines that the removal action is necessary to mitigate an immediate risk to human health, welfare, or the environment or that the removal action is otherwise appropriate and consistent with anticipated long-term remedial action. Funds expended to conduct an EE/CA are CERCLA Section 104(b)(1) monies and are not counted toward the \$2 million statutory limit for removal actions.

To the extent that a removal action, or any portion thereof, is to be performed by USCG pursuant to the CWA, the funding for this work is administered by the OSLTF.

### **2.2 Determination of Removal Scope and Objectives**

#### **2.2.1 Removal Action Scope**

The scope of the proposed removal action is to prevent the discharge of oil to the Columbia River and to remove reduce hazardous substances to acceptable human health and ecological risk-based concentrations. The scope corresponds to the following removal factors identified in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP):

Prevention or abatement of actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants [40 CFR § 300.415 (b)(2)(i)], and prevention or abatement of actual or potential contamination of sensitive ecosystems from hazardous substances or pollutants or contaminants[40 CFR § 300.415 (b)(2)(ii)].

### **2.3 Removal Action Objectives**

Based on the scope of the removal action, the following removal action objectives have been developed:

- Remove and recycle or dispose of any residual oil and oily water from below deck and oil-filled equipment, where practicable.
- Remove hazardous substances and oil to prevent human and ecological exposures to risk-based concentrations by ingestion, inhalation or dermal contact.
- Dispose of waste streams in accordance with CERCLA's Off-site Rule requirements.

These objectives will be achieved by meeting specified cleanup levels while working within the statutory limits and attaining potential applicable and relevant and appropriate requirements (ARARs) to the extent practicable.

## 2.4 Applicable or Relevant and Appropriate Requirements

Potential ARARs have been screened to aid in technology and alternative evaluation. For this response, on-site actions must comply with the substantive requirements of any identified ARARs, to the extent practicable considering the exigencies of the situation. On-site actions do not have to comply with the corresponding administrative requirements such as permit applications, reporting, and recordkeeping. Off-site actions must comply with all legally applicable requirements.

ARARs are divided into the following categories:

- **Chemical-specific requirements** are health- or risk-based concentration limits or ranges in various environmental media for specific hazardous substances, pollutants, or contaminants.
- **Action-specific requirements** are controls or restrictions on particular types of activities, such as hazardous waste management or wastewater treatment. Examples of action-specific requirements would be state and federal air emissions standards as applied to an in situ soil vapor extraction treatment unit.
- **Location-specific requirements** are restrictions on activities that are based on the characteristics of a site or its immediate environment. An example would be restrictions on work performed in wetlands or wetland buffers.

The potential chemical-, location-, and action-specific ARARs for the EE/CA are summarized in [Appendix B](#).

## 2.5 Removal Schedule

The general schedule for removal activities, including the start and completion time for the non-time-critical removal action, will be subject to determinations made by USCG. However, the approximate time frames for the major project phases are estimated below:

- The removal action schedule for Alternative 1 is estimated at 2 months duration, from mobilization, through sealing and securing the vessel in place. The removal action schedule for Alternative 2 is estimated at 2 to 3 years depending on the length of time needed to complete a risk assessment to support a PCB bulk product waste risk-based disposal approval.
- The removal action schedule for Alternative 3 is estimated at 7 months duration, from mobilization through ocean disposal, and includes obtaining a finding by the Administrator that the risk to health or the environment associated with a chemical substance (PCBs) can be eliminated or reduced to a sufficient extent by actions taken under other authorities (here the MPRSA) contained in other federal laws administered in whole or in part by the Administrator.
- The removal schedule for Alternative 4 is estimated at 7 months duration, from mobilization through recycling. The longer schedule items include dewatering at two weeks, removal and disposal of hazardous and solid waste at 40 days, and vessel dismantling and recycling at 50 days.

### 3.0 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

To achieve the removal action alternatives (RAOs) established for LST-1166, a range of potential cleanup options and engineering controls were considered. From these, a specific list of the most feasible removal alternatives was developed and is presented in this section. The following comprehensive removal alternatives have been developed to address contamination:

- Sealing, Securing, and Berthing In Place
- Ocean Disposal under the MPRSA with Partial Decontamination and TSCA PCB Bulk Product Waste Risk-Based Disposal Approval
- Ocean Disposal under the MPRSA with Partial Decontamination and TSCA 9b Finding for Disposal of PCBs under the ~~Marine Protection, Research, and Sanctuaries Act~~ (MPRSA)
- Decontamination, Dismantling and Recycle/Disposal (Shipbreaking)

#### 3.1 Identification and Analysis of Removal Action Alternatives

##### 3.1.1 Alternative 1: Sealing, Securing and Berthing In Place

This removal action alternative includes the following actions:

- Sealing and Securing

The contaminants of concern, including non-friable encapsulated asbestos, and paint and wiring insulation containing greater than or equal to 50 parts per million (ppm) of PCBs, would not be removed under this alternative nor would any residual water, oil, and greases remaining on the interior surfaces or in equipment and machinery be removed. The hatches/doors and port holes would be welded shut or otherwise secured to prevent unauthorized access to the interior of the vessel. Any loose debris on the upper deck and superstructure, including equipment or materials not permanently attached to the vessel would be removed or permanently secured to the vessel. The vessel's hull would be evaluated to determine whether there are any holes that must be repaired to prevent the movement of water in and out of the vessel.

- Berthed in Place

Under this alternative, the vessel would remain berthed at its present location. The vessel mooring would be evaluated and altered as necessary to determine if it must be secured

further to ensure it remains berthed at its current location and to discourage unauthorized access. Additionally, hazard notices would complement the access controls by warning the public that residual contamination remains within the vessel.

**Effectiveness:** Under this alternative, the immediate human health threats posed by exposure to contaminants found within the vessel are eliminated because access to the interior of the vessel would be restricted and threats to the marine environment are eliminated because holes in the hull would be patched. -However, because the hazardous substances would remain untreated and contained within the vessel, there is no reduction of contaminant toxicity or volume through treatment. There would likely be minimal short-term impacts to workers, the community, and the environment during conduct of this alternative, and this alternative could be implemented in a relatively short timeframe. -An inspection, maintenance, and monitoring plan would be developed and implemented to assure the continued adequacy and integrity of the cleanup action including containment and hazard notices warning of the asbestos and PCBs remaining within the vessel. Additionally, the vessel would likely remain an attractive nuisance, a potential navigational hazard, and pose adverse aesthetic and visual impacts.

**Implementability:** This alternative is readily implementable because of the technical ease of restricting access to the vessel, removing debris and/or welding equipment to the vessel, and evaluating the vessel's hull and making repairs, if required. The activities under this alternative can be implemented in a relatively short period of time (less than one year). Equipment, personnel and services to conduct the above activities are readily available. The alternative may require approval from other state or local agencies to continue to berth the vessel at its current location, as the State has indicated that the vessel is not legally moored in its current location. Access restriction and hazard notices would minimize the potential for human and ecological exposure to contamination by providing overlapping assurances of protection from contamination. However, the responsibility for the long-term maintenance and adequacy of this alternative for continued protection from residual contamination contained within the vessel is yet to be determined, and may ultimately fall to the Responsible Party. In addition, it is unclear if the vessel is legally moored in its current location, and this issue may require additional investigation.

**Cost:** The total estimated present value cost for this alternative is \$407,906. Since the anticipated time frame for the completion of the removal is less than 12 months, the estimated cost is equal to the capital cost for the base year plus operation and maintenance (O&M) costs for 30 years. O&M costs will be incurred as post removal site control may be required. Details of the cost estimate and assumptions used are presented in [Section A.1.1](#) and Table 1 of [Appendix A](#).

### **3.1.2 Alternative 2: Ocean Disposal with Partial Decontamination and TSCA PCB Bulk Product Waste Risk-Based Disposal Approval**

This removal action alternative includes the following activities:

- Pre-removal structural assessment and inspection

Pre-removal inspection and assessment of the vessel will include assessing the structural integrity of the various areas (e.g., decks, hull, superstructure, etc.). It will also include inspection of environmental conditions in and outside the vessel. The inspection will cover areas that could not be inspected during previous inspections. The information generated from the pre-removal assessment and inspection will be used to develop or finalize the removal design work plan and for health and safety. The results of the structural assessment will also identify any areas of the vessel that would require repair and/or reinforcing before the vessel is towed to sea.

- Removal and disposal of approximately 12,730 pounds of solid/hazardous waste which includes wire insulation (see below).

Solid and hazardous wastes that have been placed in 55-gallon drums will be loaded on trucks and transported to an off-site permitted landfill for disposal.

- Removal and disposal of approximately 600 pounds of loose friable paint chips.

Loose friable and paint chips will be vacuumed from floors and surfaces of the interior of the vessel. A HEPA-equipped vacuum will be used for this cleanup. The waste will be collected in 55-gallon drums which will be transported by trucks to an off-site permitted landfill for disposal.

- Removal and disposal of approximately 40,000 cubic yards of foam (non-hazardous).

During the inspection of the vessel it was observed that trespassers had exposed and removed foam in certain areas of the vessel. Polyurethane foam will be restricted in closed compartments in order to successfully scuttle the vessel at the bottom of the ocean. All loose and exposed foam will be removed from the vessel. It is estimated that approximately 40,000 cubic yards of non-hazardous foam needs to be removed from the vessel. The removed foam will be transported by trucks to a non-hazardous waste landfill. Should the foam be found to be hazardous, it will be handled and transported to a hazardous waste landfill.

- Removal and treatment of 500,000 gallons of non-oily water

U.S. EPA's inspection of the vessel in 2010 indicated the presence of standing water (20 feet deep) in the lower two decks due to broken seals (EPA 2010a). The water will be pumped out through a carbon filter to remove suspended solids and discharged back to the river. It is anticipated that a small amount of sludge may be generated and will be disposed off-site at a permitted non-hazardous landfill. The seal will be inspected and repaired to ensure water is removed to the extent practicable. Should the sludge be found to be hazardous, it will be handled and transported to a hazardous waste landfill

All solid/hazardous wastes removed will be disposed off-site at a permitted treatment, storage and disposal (TSD) facility in accordance with state and federal laws. PCB paint removal, except for friable chips, would not be conducted under this alternative. The cost estimates for these activities are included in Table 1 of [Appendix A](#).

The following activities will be carried out to prepare the vessel for disposal.

- Preparation of deck and superstructure
- Preparation of below deck
- Preparation of hull

The above activities include removing or securing all loose equipment, removing any residual oils in the equipment, and generally removing or securing any loose items that could become floating debris during disposal. On the main deck and the lower tank transport deck, EPA observed engines, generators, cables, winches, girders, several boom arms and other assorted equipment. The equipment will be removed, welded in place, secured, or caged to the vessel before the vessel can be scuttled. Some of the equipment may contain residual oils and this equipment will be inspected and if residual oils are discovered they will be removed, if practical.

Below are detailed activities that will be carried out during preparation and removal at various areas of the vessel before disposal.

1. Upper deck area:
  - a. Rear deck: Winches will be battened down and welded in place.
  - b. Midship: There are forklifts at midship which could contain residual oils. The forklifts will be removed or cleaned and tied down.
  - c. Ropes and cables, steel on deck will be removed and disposed as appropriate.

- d. Stern end, starboard and port: Draw works and winches will be secured to the deck by bolts or welding. A boom or lift arm on the on one end appears to be resting on the deck, the other is attached to the winch. The free end must be welded down.
  - e. Pallets and hoses at rear deck, and engines, generators will be removed.
  - f. Mid-deck: Presence of girders; rusty and flaked paint were observed. Loose flaked, exfoliated and peeled paint will be removed. Paint chips on the deck itself will be removed from the vessel. Girders will either be removed or taken to a lower deck and either welded in place or secured in a sealed compartment.
  - g. Bow: steel ramp and wooden hatch cover. The wooden hatch cover will be removed and disposed off-site. The steel ramps are apparently used to seal below deck areas off and must remain in place. Measures will be taken to ensure these ramps are firmly welded in place before disposal.
  - h. Bow chain house: Chains will be removed.
2. Superstructure: This consists mostly of the Pilot House at the rear of the vessel.
- a. Chips of flaking paint were observed on the deck and walls in the superstructure. These paint chips will be removed and properly disposed off-site.
  - b. There were several capacitors in the officer's area which will be removed from the vessel.
3. Rear Mess deck: This area consists of a mess hall, laundry and cooking area. There is flaking PCB-containing paint. As discussed above, loose friable and paint chips will be vacuumed from floors and surfaces of the interior of the vessel.
4. Military Tank Storage deck: The following applies to all equipment remaining on this deck. It was observed at least several engines, generators and other machinery standing at various locations. If equipment can be removed from the vessel, then it will be removed, otherwise, it will be thoroughly checked and cleaned of any residual oils, and then either welded down, or confined within a caged area.
5. Lower decks: These decks could not be inspected due to standing water, following breakage of a seal. The depth of this water was estimated at as much as 20 feet deep. The lower decks have apparently been cleaned of petroleum-based liquid and fuels. The water will be pumped out through a filter before inspecting the lower decks to determine if they have been cleaned of liquid fuels and petroleum products.
- Removal and disposal of approximately 14,850 lbs of electrical wiring (10,730 lbs of insulation and 3,519 lbs of copper).

Most of the easily accessible wiring in the vessel has been removed by scavengers for the recyclable copper content. The insulation that remains (approximately 10,730 pounds

remain on board) will be removed and disposed off-site at a permitted TSD facility. Reported concentrations of PCB that range from <0.50 mg/kg to 2,160 ppm, therefore, disposal facility shall be in compliance with the requirement of TSCA for PCB disposal. The remaining 3,519 lbs of cooper will be recycled.

- Removal and disposal of PCB paint from an area measuring approximately 12,000 square feet.

PCB paint will be removed using appropriate PCB paint removal methods, including sand blasting, bead blasting, water blasting, and scarification. PCB containment method commensurate with the method used will be utilized during the removal process. Appropriate personal protective equipment (PPE) and dust control measure will be implemented. The waste will be disposed off-site at a permitted TSCA or RCRA Subtitle C landfill.

- PCB Bulk Product Waste Risk-based Disposal Approval  
To dispose of PCBs left on-board the vessel exceeding 50 ppm, a risk-based disposal approval will be obtained.

The vessel, at the point of ocean disposal, would be considered PCB bulk product waste which under TSCA is a waste derived from a manufactured product containing PCBs in a non-liquid state at any concentration where the concentration at the time of designation for disposal was  $\geq 50$  ppm PCBs. A person wishing to dispose of PCB bulk product waste other than by disposal requirements under 40 CFR 761.62(a) or (b), must apply in writing to the Regional Administrator for approval. The application must contain information indicating, based on technical, environmental or waste-specific characteristics or considerations, disposal will not pose an unreasonable risk [of] injury to health or the environment. A risk-assessment would be conducted to provide the necessary information to the Regional Administrator. The risk assessment would include sampling, analysis as necessary to document the nature and quantity of PCBs remaining aboard the vessel, and an evaluation of the release mechanisms, and environmental transport, as well as an identification of potentially affected receptors and the effects of PCBs on them. The risk assessment would undergo technical review before being submitted to the Regional Administrator. It is estimated that a risk assessment would take a minimum of 2 years to complete. Completion of a risk assessment does not automatically ensure EPA approval of a risk-based disposal approval. Once the risk assessment is completed, the assessment would be sent to the Regional Administrator to meet the information requirements of the application for a risk-based disposal approval.

After EPA receives the information, a written decision on the application is issued. The application is approved if EPA finds that the method of disposal will not pose an unreasonable risk of injury to health or the environment. Any EPA decision-making process would almost certainly involve public notice and comment.

Following removal described above, and after obtaining the risk-based disposal approval, the vessel will be prepared and secured, and disposed of under the MPRSA as described below: The vessel must be made available for inspection by the USCG and EPA in advance of transportation of the vessel to a selected disposal site that has been reviewed by EPA for information on the potential effect of the vessel disposal on the marine environment. Before transportation of the vessel for disposal, EPA and the USCG must agree that qualified personnel have removed to the maximum extent practicable all materials which may degrade the marine environment. To dispose of the vessel, all necessary measures must be taken to insure the vessel sinks to the bottom rapidly and that marine navigation will not be impaired. Disposal shall take place during daylight hours. 48 hour notification and 12 hour advance notification must be provided to EPA and USCG before the vessel may be transported. The coordinates of the actual disposal site must be provided in writing to NOAA Office of Ocean Survey within a week of the disposal. It is expected that the vessel will be towed to a location approximately 65 nautical miles from the mouth of Columbia River ([Figures 2–4](#)) and will be scuttled to the bottom of the ocean floor at the depth of approximately 1,000 fathoms (over a mile). NOAA has already ~~approved~~ reviewed the proposed disposal location for potential effects of the vessel to the marine environment (NOAA, 2009). Sinking the vessel to the bottom of the ocean will involve mechanical perforation of the exterior hull allowing the ship to flood. The location of the disposal will be mapped using Geographic Information System (GIS). Best management practices (BMPs) and engineering controls will be employed to minimize impact of this removal on human health and the environment. A weather window from May to October exists for towing the vessel to the ocean.

Effectiveness: This alternative will permanently remove the source of contamination from the current location, eliminate potential exposure routes, and protect public health, the environment and ecology of the Columbia River, and the community. Additionally, this alternative removes PCBs in the solid materials on the vessel, thereby minimizing any impact at the disposal location. Short-term, there is a potential exposure to the workers preparing the vessel for removal. However, this can be minimized by use of BMPs, engineering controls and appropriate personal protective equipment. At the disposal location, at the bottom of the ocean, there are no human receptors that will come into contact with any residual contamination and it is expected that most of the PCBs will be removed from the vessel entirely, leaving few sources of potential PCB contamination. This alternative complies with the ARARs identified in [Section 2.4](#), and

meets the RAOs as it removes potential contamination and concerns of residual effect are minimized to the maximum extent practicable. The final disposition of the vessel is a long-term solution that addresses the current conditions and concerns.

**Implementability:** This alternative is technically feasible as the technical know-how of such operations exists and firms with demonstrated performance record are available. The activities under this alternative can be implemented in two to four years depending on the length of time needed to conduct a risk assessment for the PCBs on the vessel. Equipment, personnel and services to conduct the above activities are readily available. The complexities introduced by the removal and disposal of PCB paint surfaces and the risk assessment to support a risk-based disposal approval are reflected in the higher cost of this alternative, but do not affect its technical feasibility. Off-site treatment and disposal facilities are available for wastes requiring disposal. This alternative is administratively feasible as permitting anticipated is minimal (i.e., Ocean Dumping General Permit). No easement or right-of-ways for access are anticipated, and no impacts to any adjoining properties are expected. State and public acceptance of this removal action will be determined during public comment period of the EE/CA.

**Cost:** The total estimated present value cost for this alternative is \$3,287,566. A present value cost was calculated because the anticipated time frame for the completion of the risk assessment and removal is greater than 12 months. Details of the cost estimate and assumptions used are presented in [Section A.1.2](#) and Table 2 of [Appendix A](#).

### **3.1.3 Alternative 3: Ocean Disposal with Partial Decontamination and TSCA 9b Finding for Disposal of PCBs under the Marine Protection, Research, and Sanctuaries Act (MPRSA)**

This removal action alternative includes all the activities outlined under Alternative 2 with the exception of obtaining the TSCA PCB Bulk Product Waste Risk-based Disposal Approval. This alternative eliminates the risk-based disposal approval and instead adds the following activity:

Obtain a TSCA 9(b) finding by the Administrator to allow for a coordinated approach to the disposal of PCBs associated with the vessel which are regulated under both the MPRSA and TSCA. TSCA 9(b) provides that if the Administrator determines a risk to health or the environment associated with a chemical substance or mixture could be eliminated or reduced to a sufficient extent by actions taken under the [Administrator's](#) authorities contained in other Federal laws, the Administrator shall use such authorities to protect against such risk unless the Administrator determines, in the Administrator's discretion, that it is in the public interest to protect against such risk by actions taken by TSCA. The MPRSA provides sufficient authority to address risks to health or the environment posed by transportation and disposal of PCBs

associated with the vessel based on a review of the applicable legal standards and authorities under the MPRSA and TSCA. Factors to be considered in evaluating whether or not there is a “public interest” that would, under the Administrator’s discretion, suggest that TSCA be used notwithstanding the sufficiency of non-TSCA authorities, would include the relevant risks as determined by the Administrator in the Administrator’s discretion, the associated costs of complying with TSCA or the other authorities and the efficiency of the actions under the other authority to protect against the risk of injury. If the Administrator decides to exercise the Administrator’s discretion to use other authorities, such as the MPRSA, to protect against risk of injury, the Administrator will issue a written decision. TSCA requirements would apply with respect to the disposal of PCBs removed from the vessel at any time prior to its sinking and would apply if the vessel was moved from one storage berth to another. However, when the vessel was moved for the purpose of ocean disposal, the MPRSA would apply to all aspects of the disposal of the vessel.

Effectiveness: This alternative will permanently remove the source of contamination from the current location, eliminate potential exposure routes, and protect public health, the environment and ecology of the Columbia River, and the community. Additionally, this alternative removes PCBs in the solid materials on the vessel, thereby minimizing any impact at the disposal location. Short-term, there is a potential exposure to the workers preparing the vessel for removal. However, this can be minimized by use of BMPs, engineering controls and appropriate personal protective equipment. At the disposal location, at the bottom of the ocean, there are no human receptors that will come into contact with any residual contamination and it is expected that most of the PCBs will be removed from the vessel entirely leaving very few sources of future PCB contamination. This alternative complies with the ARARs identified in [Section 2.4](#), and meets the RAOs as it removes potential contamination and concerns of residual effect are minimized to the maximum extent practicable. The final disposition of the vessel is a long-term solution that addresses the current conditions and concerns.

Implementability: This alternative is technically feasible as the technical know-how of such operations exists and firms with demonstrated performance record are available. The activities under this alternative can be implemented in under 12 months depending on the length of time needed to obtain the TSCA 9(b) finding by the Administrator. Equipment, personnel and services to conduct the above activities are readily available. The complexities introduced by the removal and disposal of PCB paint surfaces are reflected in the higher cost of this alternative, but do not affect its technical feasibility. Off-site treatment and disposal facilities are available for wastes requiring disposal. This alternative is administratively feasible as permitting anticipated is minimal (i.e., Ocean Dumping General Permit). No easement or right-of-ways for access are anticipated, and no impacts to any adjoining properties are expected. State and public

acceptance of this removal action will be determined during public comment period of the EE/CA.

Cost: The total estimated cost for this alternative is \$3,283,823. Since the anticipated time frame for the completion of the removal is less than or equal to 12 months, the estimated cost is Details of the cost estimate and assumptions used are presented in [Section A.1.2](#) and Table 2 of [Appendix A](#).

#### **3.1.4 Alternative 4: Decontamination, Dismantling and Recycling/Disposal (Shipbreaking)**

This removal action alternative incorporates all the activities outlined under Alternatives 2 and 3, except the disposition of the vessel and neither the risk-based approval or the TSCA 9(b) finding would be part of the alternative. Some of the activities outlined in Alternatives 2 and 3 are conducted in different sequences and locations. The following activities are unique to Alternative 4:

- After removal and treatment of approximately 500,000 gallons of non-oily water and securing equipment onboard, the vessel will be then towed using tugs to a dry dock. This activity will be conducted as described under Alternative 2.
- Removal of the solid and hazardous materials outlined in Alternatives 1 and 2 and 3 will be carried out at the dry dock.
- After PCB removal, the superstructure and any other recyclable materials will be segregated from non-recyclable solid wastes for recycling/disposal.
- It is anticipated that approximately 2,400 tons of steel/metal will be recycled.

Effectiveness: This alternative will permanently remove the source of contamination, eliminate potential exposure routes, and protect public health, the environment and ecology of the Columbia River, and the community. Short-term, there is a high potential exposure to the workers preparing the vessel for removal and dismantling. However, this can be minimized by use of BMPs, engineering controls and appropriate personal protective equipment. No residual contamination is expected to remain once removal is complete. This alternative complies with the ARARs identified in [Section 2.4](#), and meets the RAOs as it removes all potential contamination and no concerns of residual effect exist. The final disposition of the vessel is a long-term solution that recycles/disposes the vessel and its contents in an appropriate manner.

From the standpoint of green remediation principles, this alternative would be effective at reducing the carbon footprint through recycling the scrap steel/metal comprising the vessel, and

produce economic benefit at the steel/metal end of life cycle. In addition, this alternative creates more jobs than Alternatives 1, 2 and 3.

Implementability: This alternative is technically feasible as the technical know-how of such operations exists and firms with demonstrated performance record are available in Portland Harbor and other West and Gulf Coast Facilities. The activities under this alternative can be implemented in a relatively short period of time (less than one year). Facilities (both dry dock and upland yard), equipment, personnel and services to conduct the above activities are readily available. The complexities introduced by the removal and disposal of PCB and lead paint surfaces, and dismantling of the vessel are reflected in the higher cost of this alternative, but do not affect its technical feasibility. Off-site treatment and disposal facilities are available for wastes requiring disposal. This alternative is administratively feasible as no permitting is anticipated other than those required for the ship breaking facility. No easement or right-of-ways for access are anticipated, and no impacts to any adjoining properties are expected. If a Portland Harbor facility is selected that is within the Portland Harbor Superfund site it will not present an issue because it is expected that all the contaminants that could be released from the vessel will be managed to avoid any release. ~~have already been removed.~~ State and public acceptance of this removal action will be determined during public comments and evaluation of the EE/CA and Action Memorandum.

Cost: The total estimated cost for this alternative is \$4,174,099. Since the anticipated time frame for the completion of the removal is less than 12 months, the estimated cost is equal to the capital cost for the base year. As such no present worth costs are calculation, since no O&M cost will be incurred as post removal site control is not required. Dismantling a ship is a complex and costly task, however, this cost is offset by the benefits realized from recycling the vessel's scrap steel/metal. From the standpoint of green remediation principles, this alternative would be effective at reducing the carbon footprint through recycling the scrap steel/metal and copper comprising the vessel, and produce economic benefit at the end of life cycle. In addition, this alternative creates more jobs than Alternatives 1 and 2. Details of the cost estimate and assumptions used are presented in [Section A.1.3](#) and Table 3 of [Appendix A](#).

#### 4.0 COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

In this section, removal action alternatives are analyzed against the three criteria as outlined in the NTCRA Guidance: effectiveness, implementability, and cost. Each of these criteria is described below.

Effectiveness: How well each alternative (1) protects public health and the environment, including long-term effectiveness and permanence and short-term effectiveness, (2) complies with ARARs, and (3) achieves removal objectives.

Implementability: The technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation.

Cost: The direct and indirect capital costs and annual post removal site control (PRSC) costs associated with an alternative.

The analysis of the four alternatives with regard to these three criteria is presented in [Section 3.0](#).

Below is a summary of comparative evaluation of the alternatives with regard to effectiveness, implementability and cost. These Alternatives are:

- Alternative 1: Sealing, Securing, and Berthing In Place
- Alternative 2: Ocean Disposal with Partial Decontamination and TSCA PCB Bulk Product Waste Risk-Based Disposal Approval
- Alternative 3: Ocean Disposal with Partial Decontamination and TSCA 9b Finding for Disposal of PCBs under the Marine Protection, Research, and Sanctuaries Act (MPRSA)
- Alternative 4: Decontamination, Dismantling and Recycling/Disposal (Shipbreaking)

Effectiveness: All four alternatives are protective of public health, the environment and ecology of the Columbia River, and the community. All four alternatives permanently remove the source of contamination to humans and ecology of the Columbia River. However, because of the level of decontamination and final disposition of the vessel, Alternative 4 has a benefit over the other three alternatives as no disposal in the ocean will occur and environmental benefits from recycling will be achieved. In addition, Alternative 4 creates more jobs than Alternatives 1, 2 and 3. Similarly, Alternatives 2 and 3 provide a level of decontamination that does not allow disposition of the majority of PCBs at the bottom of the ocean.

All four alternatives will have potential short-term impact on workers; however, this impact is minimal for Alternative 1. The degree of potential short-term impact is greater for Alternatives 2, 3 and 4 because of the level of decontamination and much higher than for Alternative 1. In addition, the highest potential short-term impact is greatest for Alternative 4 because of the

dismantling activities. The short-term impact can be mitigated by implementing BMPs, engineering controls and appropriate personal protective equipment.

All four alternatives meet the ARARs and the removal action objectives as they permanently remove the source of contamination and eliminate the exposure routes. Although in Alternative 1 the decontamination is minimal, there are no exposure routes that are complete at the vessel's berthing location, and the risk evaluation presented in Section 1.4, determined that the proposed project will have no adverse effect on the species and critical habitat identified in Section 4.0 during the sealing, berthing in place, removal and transportation elements of the action or on the deepwater benthic and pelagic communities at the proposed disposal site. The disposal location proposed for Alternatives 2 and 3 is much different than a shallow reef environment. The location is in 6000 feet of water, 65 miles from shore. There are far fewer known environmental resources present; a much lower energy environment exists; the environment is much colder; and the water pressures far higher than the shallow reef environment. Therefore, no residual effect on human health and the environment is anticipated.

Implementability: All four alternatives are technically feasible, because the know-how of the operations for these alternatives exists, and firms with track record in decontamination, dismantling or scuttling a ship are available. Equipment and personnel are readily available for all four alternatives. There are varying degrees of difficulty in implementing each alternative. Alternatives 2 and 3 present the challenge of safely sinking the ship to the bottom of the ocean, and Alternative 4 presents the challenge of dismantling the vessel and segregation of recyclable materials from the solid/hazardous waste for disposal. These degrees of difficulties are reflected in the cost and do not impact the technical feasibility of each alternative. All four alternatives can be implemented in a relatively short period of time (less than 12 months to 2+ years). Alternatives 2, 3 and 4 will require a statutory exemption for the costs exceeding \$2,000,000 and Alternative 2 will require a statutory exemption for the schedule, which exceeds one year. All four alternatives are administratively feasible as no easement or right-of-ways for site access are anticipated, and no impact to any adjoining properties is expected. There will be permit requirements for Alternatives 2 and 3 for the ocean disposal (i.e., Ocean Dumping General Permit). No action-specific permits are anticipated for Alternative 4. The ship breaking facility will have to comply with all applicable permit requirements. For Alternative 4, it is assumed that the ship breaking facility is located in Portland Harbor.

Cost: The detailed estimated costs for the alternatives are presented in Tables 1 through 4 in [Appendix A](#). Since the removal actions for Alternatives 3 and 4 will be completed within a period of 12 months all costs are capital cost of the base year (2011) and reflect a present value cost for 2011. Alternative 2 is estimated to take 3 years and the cost estimate was adjusted to

using a present value analysis to adjust for the potential productivity and increasing value of money, assuming positive-return investments. Similarly, Alternative 1 has on-going O&M costs and this cost estimate is adjusted using a present value analysis.

The total estimated present value costs of the alternatives are \$407,906 for Alternative 1, \$ 3,423,942 for Alternative 2, \$ 3,287,566 for Alternative 3, and \$4,174,099 for Alternative 4, respectively. The costs for Alternatives 2-4 are in the same order of magnitude and Alternative 1 is substantially less. While Alternative 4 is the most expensive, Alternative 4 has a green remediation component; the other alternatives do not. For purpose of costing ~~we did not consider~~ shipbreaking facilities in other locations (West Coast or Gulf Coast) were not considered due to increased costs.

The cost estimates in this EE/CA are based on the description of the alternatives and associated assumptions presented in this EE/CA. The assumptions used here are reflective of the activities anticipated and sufficient for the purposes of comparative evaluation of the alternatives, but are not necessarily the same as the design basis that would be used for the final, detailed design.

The cost estimates were prepared to allow comparative evaluation of alternatives, not for budgeting purposes. The uncertainties in the EE/CA designs and associated cost estimates are such that actual costs could vary significantly from these estimates. However, the uncertainty in the *relative* cost of the alternatives is much less than the uncertainty in the magnitude of the costs, and these cost estimates are suitable for comparative evaluation of the alternatives.

This evaluation reveals that Alternative 3 is the preferred alternative. [Table 4.1](#) summarizes the comparative analysis.

**Table 4.1: Comparative Analysis Summary**

<b>NTCRA Criteria</b>	<b>Alternative 1: Sealing, Securing and Berthing In Place</b>	<b>Alternative 2: Ocean Disposal with Partial Decontamination and TSCA PCB Bulk Product Waste Risk-Based Disposal Approval</b>	<b>Alternative 3: Ocean Disposal with Partial Decontamination and TSCA 9b Finding for Disposal of PCBs under the Marine Protection, Research, and Sanctuaries Act (MPRSA)</b>	<b>Alternative 4: Decontamination, Dismantling and Recycling/Disposal (Shipbreaking)</b>	<b>Comment</b>
Effectiveness:	Protective of public health and community, and ecology. Protective of workers and the environment. Leaves contaminants in the vessel at current location. Achieves ARARs and meets RAOs by eliminating exposure routes.	Protective of public health and community, and ecology. Protective of workers and the environment. Some residual PCB will reside at the disposal location. Achieves ARARs and meets RAOs by eliminating exposure routes.	Protective of public health and community, and ecology. Protective of workers and the environment. Some residual PCB will reside at the disposal location. Achieves ARARs and meets RAOs by eliminating exposure routes.	Protective of public health and community, and ecology. Protective of workers and the environment. Removes COPCs from the vessel. Achieves ARARs and meets RAOs by eliminating exposure routes.	Based on the research developed in the streamlined risk evaluation above, we have determined that the proposed project will have no adverse effect on the species and critical habitat identified in Section 4.0 during the sealing, and berthing, removal and transportation elements of the action or on the deepwater benthic and pelagic communities at the proposed disposal site. Alternatives are rated relative to the level of decontamination achieved.
Effectiveness Qualification	<b>Fair</b>	<b>Good</b>	<b>Good</b>	<b>Good</b>	

Implementability	Technically feasible. Know-how, equipment and personnel are readily available. No easements or right-of-way required. No impact to adjoining properties anticipated. No permitting. Coordination with the Oregon DLCD (the State agency that controls the state-owned submerged lands) will be required to address any legal issues associated with the berthing the vessel at this location.	Technically feasible. Know-how, equipment and personnel are readily available. No easements or right-of-way required. No impact to adjoining properties anticipated. Minimal permitting for ocean disposal.	Technically feasible. Know-how, equipment and personnel are readily available. No easements or right-of-way required. No impact to adjoining properties anticipated. Minimal permitting for ocean disposal.	Technically feasible. Know-how, equipment and personnel are readily available. No easements or right-of-way required. No impact to adjoining properties anticipated. No permitting anticipated, other than that required by the shipbreaking facility.	Ocean Dumping General Permit is required for Alternatives 2 and 3. No permitting is anticipated for Alternative 4, but it has more complex activities. Cost offsets any complexities in implementation. Alternative 2 has the longest schedule
Implementability Qualification	<b>Good</b>	<b>Good</b>	<b>Good</b>	<b>Good</b>	
Cost	\$407,906	\$3,287,566	\$3,283,823	\$4,174,099	Alternative 4 has green remediation component; the other alternatives do not and Alternative 4 would create more jobs than the other alternatives
Cost Qualification	<b>Best</b>	<b>Better</b>	<b>Better</b>	<b>Good</b>	

## **5.0 RECOMMENDED REMOVAL ACTION ALTERNATIVE**

Alternative 4 best satisfies the evaluation criteria for implementability and protectiveness based on the comparative analysis in [Section 4.0](#). In summary, all four alternatives provide similar levels of protectiveness, and have similar levels of implementability. However, Alternatives 2 and 3 are protective and meet all the requirements of the ocean dumping permit. Alternative 3 meets the lowest cost for a long-term solution with the shortest schedule. Alternative 1 is the lowest cost option; however, there may be legal issues with the mooring location that may need to be addressed. Alternatives 2, 3 and 4 will require a statutory exemption for the costs exceeding \$2,000,000 and Alternative 2 will require a statutory exemption for the schedule, which exceeds one year.

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## PHOTOGRAPHS

**Photo 1: Historical Photo**

Photo # K-78101 USS Washtenaw County moored in Subic Bay, October 1969



**Photo 2: Port View**



**Photo 3: Stern View**



**Photo 4: Flaking Ceiling Paint**



**Photo 5: Flaking Ceiling Paint**



**Photo 6: Jacketed Electrical Wiring**



## FIGURES

**Figure 1: Site Location Map**

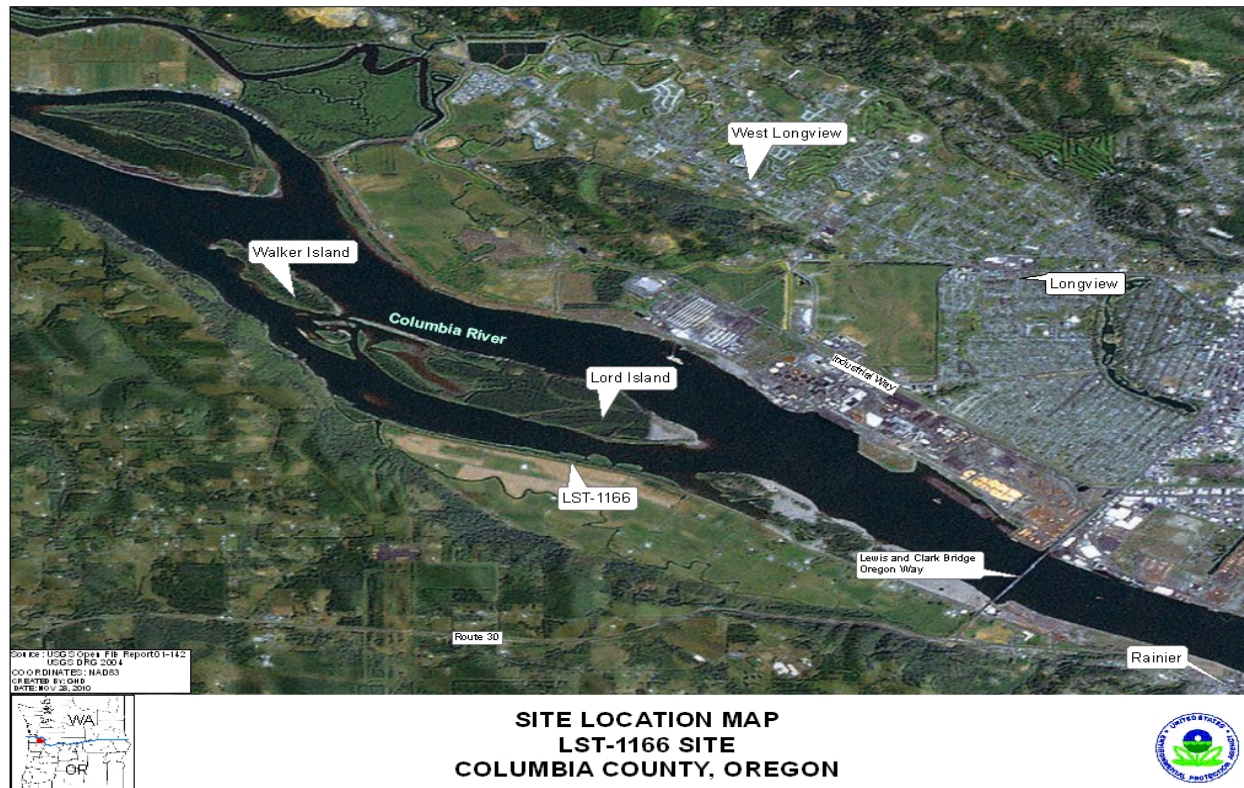
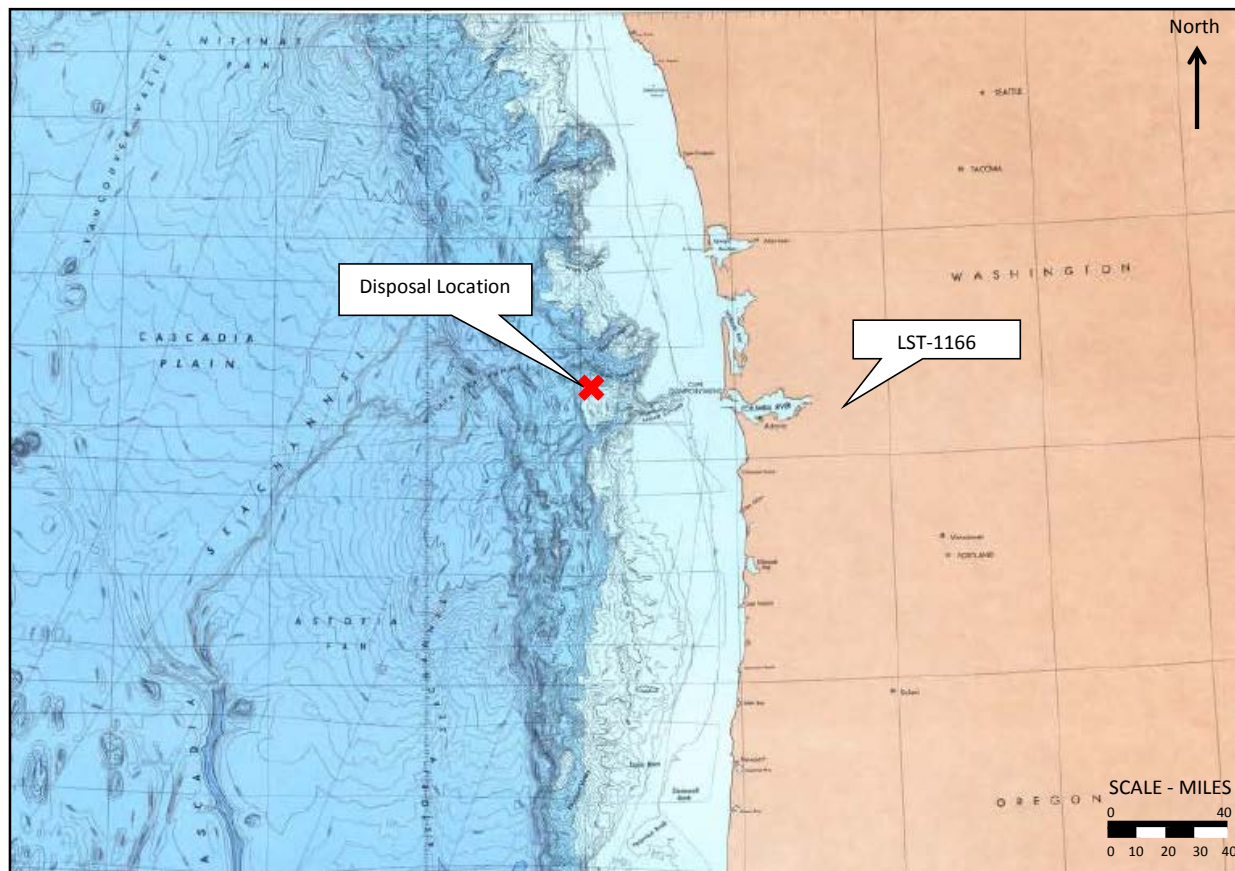
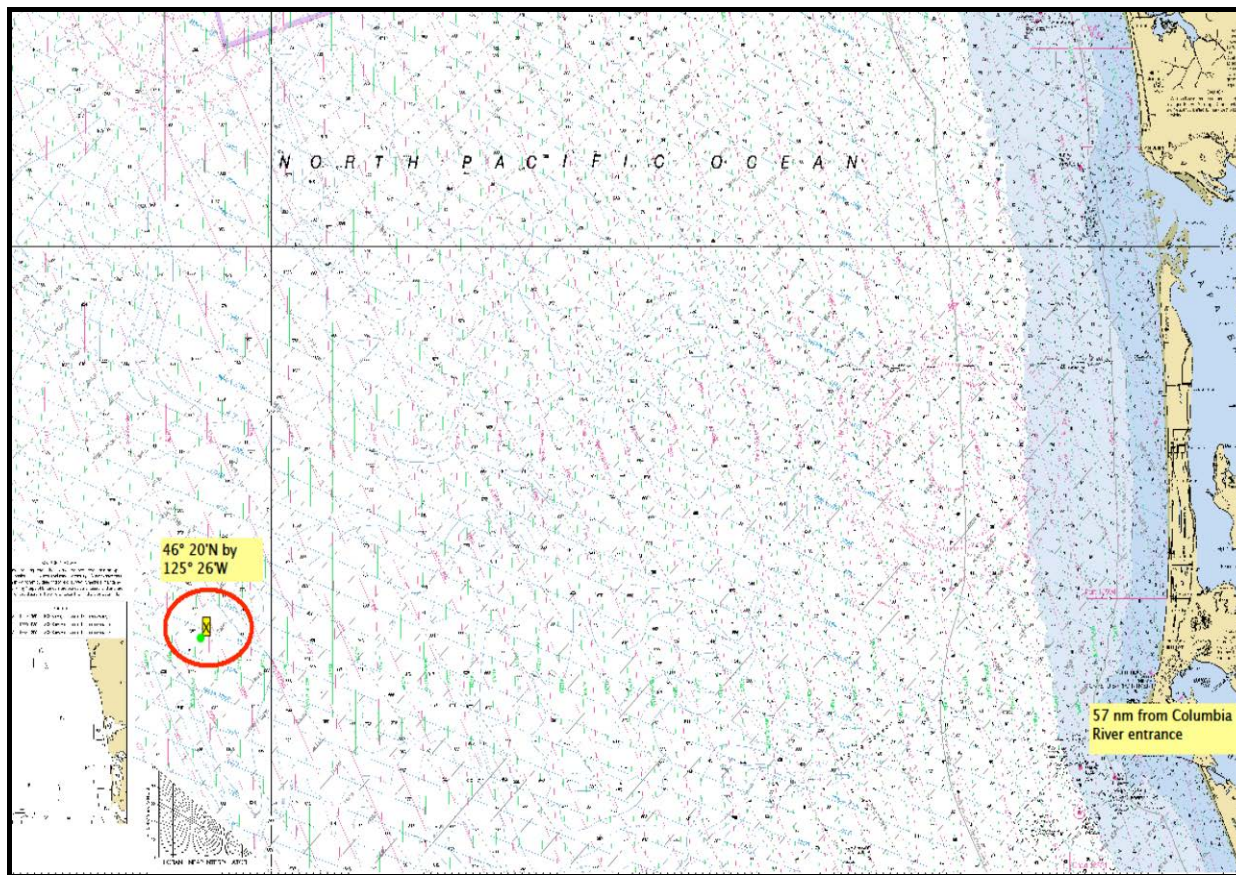


Figure 2: Disposal Location Map

<http://www.ngdc.noaa.gov/mgg/bathymetry/maps/previews/12042-12B.pdf>

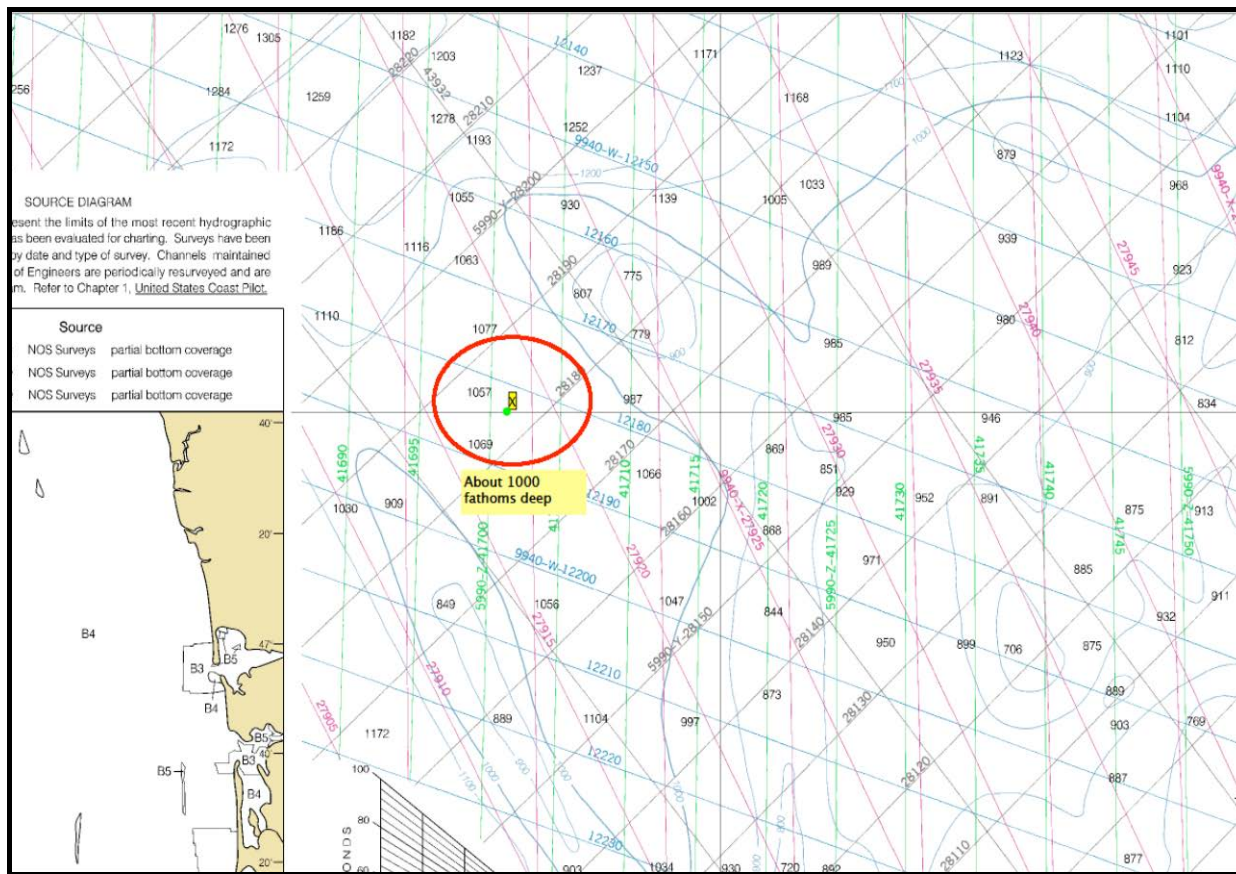


**Figure 3: Disposal Location Map**



Reference: Steve Capps 2009

**Figure 4: Disposal Location Map**



Reference: Steve Capps 2009

**APPENDIX A**

## A.1 Cost Estimates

Cost estimates were prepared for each of the four removal alternatives; 1) Sealing, Securing and Berthing In Place, 2) Ocean Disposal with Partial Decontamination and TSCA PCB Bulk Product Waste Risk-Based Disposal Approval, 3) Ocean Disposal with Partial Decontamination and TSCA 9b Finding for Disposal of PCBs under the Marine Protection, Research, and Sanctuaries Act (MPRSA), and 4) Decontamination, Dismantling Recycling/Disposal (Shipbreaking). The accuracy of the estimates may vary because details may change when the removal action is designed. Cost estimates for remedy selection are intended to provide an accuracy of plus 50 percent to minus 30 percent (USEPA, 2000)

The general and specific assumptions used to generate the cost estimates are presented herein. The cost estimate tables; including quantities, unit costs, contingencies, overhead, profit, permitting and health and safety for the site are presented in Tables 1 through 3. Specific line item assumptions are also included within these tables. The costs presented in these tables are estimated based on vendor quotes, RS Means, professional experience and/or the assumptions stated. RS Means' 2004 Environmental Remediation Cost Data – Unit Price and RS Means' 2004 Environmental Remediation Cost Data – Assemblies were used for certain unit costs estimates as indicated. Costs have been escalated from 2004 to 2011 using a 2.7% inflation rate, based upon the rates published in Appendix C of Circular A-94 Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs (United States Office of Management and Budget 2009).

Since the anticipated time frames for Alternatives 3 and 4 are less than 12 months and on-going operations and maintenance costs are not applicable to the removal alternatives, Capital Costs were calculated and used as the present value cost. Alternative 2 is estimated to take approximately 3 years and this cost estimate was adjusted to a using a present value analysis to adjust for the potential productivity and increasing value of money, assuming positive-return investments. Similarly, Alternative 1 has an on-going O&M costs and this cost estimate is adjusted using a present value analysis. A discount rate of 2.7% was used in present value analysis for Alternatives 1 and 2. The discount rate was selected based upon the rates published in Appendix C of *Circular A-94 Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs* (United States Office of Management and Budget, January 2009). Present value costs were then used as a basis for estimating total costs and in alternatives comparison.

Due to the limited information/documentation on the LST 1166, a contingency allowance of 25% was utilized for each alternative. Costs assume a health and safety personal protective equipment level (PPE) of modified D except where contaminant specific procedures require more stringent protection.

For certain cost estimate line items, an additional contingency (usually 100%) is applied for activities that require complicated access issues.

The following sections present the assumptions used for each alternative.

#### **A.1.1 Alternative 1: Sealing, Securing and Berthing In Place**

The following general assumptions were used to generate a cost estimate for Alternative 1:

- The hatches/doors and port holes would be welded shut
- Securing equipment on-board the vessel
- The vessels' hull would be evaluated and repaired, as necessary
- Mooring evaluation
- Operations and maintenance (O&M) costs (30 years) – estimated to be 20% of Capital Costs

Additional descriptions and assumptions for specific lines items are included in Table 1.

#### **A.1.2 Alternative 2: Ocean Disposal with Partial Decontamination and TSCA PCB Bulk Product Waste Risk-Based Disposal Approval**

The following general assumptions were used to generate a cost estimate for Alternative 2:

- Removal and disposal of approximately 2,000 pounds of solid/hazardous waste
- Removal and disposal of approximately 600 pounds of friable paint chips
- Removal and disposal of approximately 44,445 cubic yards of foam
  - Non-hazardous disposal
- Removal and treatment of 500,000 gallons of non-oily water
  - Pumped through a carbon filter and discharged back into the river
- Removal and disposal of approximately 14,850 lbs of electrical wiring (10,730 lbs of insulation for disposal).
- Removal and disposal of polychlorinated biphenyls (PCB) paint from an area measuring approximately 12,000 square feet
- Risk Assessment - PCB Bulk Product Waste Risk-based Disposal Approval (Timeframe – Approximately 2 years)
- Securing equipment on-board the vessel
- Preparation of deck and superstructure
- Preparation of below deck
- Preparation of hull
- Towing and scuttling of the vessel 65 nautical miles from the mouth of the Columbia River

Additional descriptions and assumptions for specific lines items are included in Table 2.

**A.1.3 Alternative 3: Ocean Disposal with Partial Decontamination and TSCA 9b Finding for Disposal of PCBs under the Marine Protection, Research, and Sanctuaries Act (MPRSA)**

The following general assumptions were used to generate a cost estimate for Alternative 3:

- Removal and disposal of approximately 2,000 pounds of solid/hazardous waste
- Removal and disposal of approximately 600 pounds of friable paint chips
- Removal and disposal of approximately 44,445 cubic yards of foam
  - Non-hazardous disposal
- Removal and treatment of 500,000 gallons of non-oily water
  - Pumped through a carbon filter and discharged back into the river
- Removal and disposal of polychlorinated biphenyls (PCB) paint from an area measuring approximately 12,000 square feet
- Removal and disposal of approximately 14,850 lbs of electrical wiring (10,730 lbs of insulation for disposal).
- Securing equipment on-board the vessel
- Preparation of deck and superstructure
- Preparation of below deck
- Preparation of hull
- Towing and scuttling of the vessel 65 nautical miles from the mouth of the Columbia River

Additional descriptions and assumptions for specific lines items are included in Table 3.

**A.1.4 Alternative 4: Decontamination, Dismantling Recycling/Disposal (Shipbreaking)**

The following general assumptions were used to generate a cost estimate for Alternative 4:

- Removal and treatment of approximately 500,000 gallons of non-oily water
  - Pumped through a carbon filter and discharged back into the river

After the above removal actions are completed, the vessel will be prepared for transport and dry docking including:

- Securing equipment on-board the vessel
- Preparation of deck and superstructure
- Preparation of below deck

- Preparation of hull

The vessel will be then towed using tugs to a dry dock located in the Portland area. At the dry dock the following activities will be completed:

- Removal and disposal of approximately 14,850 lbs of electrical wiring (10,730 lbs of insulation for disposal).
- Removal and disposal of approximately 2,000 pounds of solid/hazardous waste
- Removal and disposal of PCB paint from an area measuring approximately 12,000 square feet
- Removal and disposal of approximately 111,113 cubic yards of foam
  - Non-hazardous disposal

This estimate also assumes that the dry dock period will be three months. A substantial cost savings for recycling steel is included in this cost estimate. Additional descriptions and assumptions for specific lines items are included in Table 4.

**A.2 Cost Estimate Tables**

TABLE 1: Alternative 1: Sealing, Securing and Berthing In Place

ITEM	UNITS	QUANTITY	UNIT COST 2010	UNIT COST	TOTAL UNIT COST	ACCESS CONTINGENCY	TASK COST	DESCRIPTION/ASSUMPTIONS
<u>Capital Costs</u>								
<b>VESSEL PREPERATION</b>								
Access Point Welding	hourly	300	\$ 101.8	\$ 105	\$ 31,373		\$ 31,373	Means Crew MPLUH
Secure equipment	Day Rate	2	\$ 2,500	\$ 2,500	\$ 5,000		\$ 5,000	Estimate
Barge/Tug/Light Crane/Crew	Day Rate	2	\$ 1,000	\$ 1,000	\$ 2,000		\$ 2,000	Used to provide access/storage for activities. Equipment/Manpower verbal estimate Ryba Marine (3/1/11).
Engineering/Inspections Mooring Inspection	Hrly.	20	\$ 125	\$ 125	\$ 2,500		\$ 2,500 \$ 3,000	Unit Rates: T&T Bisso (marine salvage company). Estimated timeframe. Estimate
Hull preparation	Day Rate	2	\$ 5,500	\$ 5,500	\$ 11,000		\$ 11,000	Unit Rates: T&T Bisso (marine salvage company). Estimated timeframe.
<b>SUBTOTAL</b>							<b>\$ 54,873</b>	
<u>Indirect Capital Costs</u>								
<b>Health and Safety Implementation - 10%</b>							\$ 5,487	
<b>Overhead and Profit (Means Costs Only) - 20%</b>							\$ 6,275	
<b>Permit Acquisitions - 0%</b>							\$ -	
<b>Contingency Allowance - 25%</b>							\$ 13,718	
<b><u>TOTAL</u></b>							<b><u>\$ 80,353</u></b>	

RSMeans' 2004 *Environmental Remediation Cost Data - Unit Price* and RSMeans' 2004 *Environmental Remediation Cost Data - Assemblies*, were used for certain unit costs estimates as indicated. Costs have been escalated from 2004 to 2011 using a 2.7% inflation rate, based upon the rates published in Appendix C of Circular A-94 *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs* (United States Office of Management and Budget, January 2009).

TABLE 1: Alternative 1: Sealing, Securing and Berthing In Place

**PRESENT VALUE CALCULATION**

YEAR	CAPITAL COSTS (\$)	ANNUAL O&M (\$)	OTHER PERIODIC	TOTAL COST	TOTAL PRESENT VALUE COST (\$) *
0	\$80,353.00			\$80,353.00	\$80,353.00
1		\$16,070.00		\$16,070.00	\$15,647.52
2		\$16,070.00		\$16,070.00	\$15,236.14
3		\$16,070.00		\$16,070.00	\$14,835.58
4		\$16,070.00		\$16,070.00	\$14,445.55
5		\$16,070.00		\$16,070.00	\$14,065.77
6		\$16,070.00		\$16,070.00	\$13,695.98
7		\$16,070.00		\$16,070.00	\$13,335.91
8		\$16,070.00		\$16,070.00	\$12,985.31
9		\$16,070.00		\$16,070.00	\$12,643.92
10		\$16,070.00		\$16,070.00	\$12,311.51
11		\$16,070.00		\$16,070.00	\$11,987.84
12		\$16,070.00		\$16,070.00	\$11,672.68
13		\$16,070.00		\$16,070.00	\$11,365.80
14		\$16,070.00		\$16,070.00	\$11,066.99
15		\$16,070.00		\$16,070.00	\$10,776.04
16		\$16,070.00		\$16,070.00	\$10,492.74
17		\$16,070.00		\$16,070.00	\$10,216.88
18		\$16,070.00		\$16,070.00	\$9,948.28
19		\$16,070.00		\$16,070.00	\$9,686.74
20		\$16,070.00		\$16,070.00	\$9,432.07
21		\$16,070.00		\$16,070.00	\$9,184.10
22		\$16,070.00		\$16,070.00	\$8,942.65
23		\$16,070.00		\$16,070.00	\$8,707.54
24		\$16,070.00		\$16,070.00	\$8,478.62
25		\$16,070.00		\$16,070.00	\$8,255.72
26		\$16,070.00		\$16,070.00	\$8,038.67
27		\$16,070.00		\$16,070.00	\$7,827.33
28		\$16,070.00		\$16,070.00	\$7,621.55
29		\$16,070.00		\$16,070.00	\$7,421.18
30		\$16,070.00		\$16,070.00	\$7,226.08
TOTAL =				<b><u>\$562,453.00</u></b>	<b><u>\$407,906</u></b>

\* Discount Rate 2.7%

TABLE 2: Alternative 2: Ocean Disposal with Partial Decontamination and TSCA PCB Bulk Product Waste Risk-Based Disposal Approval

ITEM	UNITS	QUANTITY	UNIT COST 2010	UNIT COST	TOTAL UNIT COST	ACCESS CONTINGENCY	TASK COST	DESCRIPTION/ASSUMPTIONS
<u>Capital Costs</u>								
<b>RISK ASSESSMENT</b>								
Risk Assessment		1					\$250,000	Estimate
<b>VESSEL PREPARATION - DECONTAMINATION</b>								
Remove and incineration electrical wiring	LB	10730	\$ 10.07	\$ 2.27	\$ 24,360	\$ 24,360	\$ 48,720	Means 16 02 0701. Assumes 14,850 pounds of insulation on LST 1166 and that 50% is PCB-containing and will require removal and disposal. 100% access contingency.
Remove/dispose solid/hazardous waste (2000 lbs.)								
								Assumes material is already drummed
Drummed Waste Shipment Charge	each	1	\$ 2,727	\$ 2,801	\$ 2,801	\$ 2,801	\$ 5,603	Means 33 19 0201. Assumes 100% contingency for loading.
Land Transport Drums	mile	100	\$ 1.95	\$ 2.00	\$ 200	\$ 200	\$ 200	Means 33 19 0204.
Landfill Hazardous Waste 55-Gal Drums	each	3	\$ 114.37	\$ 117	\$ 352	\$ 352	\$ 352	Means 33 19 7202.
Remove/dispose friable paint/chips - 600 lbs.								
Labor	hours	450	\$ 43.99	\$ 45.19	\$ 20,336	\$ 20,336	\$ 20,336	Means - 25 02 01. Assuming a crew of 1 could vacuum a 500' area in 0.25 days. Therefore a crew of 1 could vacuum a 9000 ft² area in 45 days.
Land Transport Drums	mile	100	\$ 1.95	\$ 2.00	\$ 200	\$ 200	\$ 200	Means 33 19 0204.
Landfill Hazardous Waste 55-Gal Drums	each	3	\$ 114.37	\$ 117.49	\$ 352	\$ 352	\$ 352	Means 33 19 7202.
Remove/dispose PCB paint	ft²	0	\$ 14.84	\$ 15.24	\$ -	\$ -	\$ -	Means 25 02 0104. 6 rooms at 2000 sq.ft./room. CCS cost estimate with 100% access contingency. Disposal 6 drums of chips @ 218/drum (11/10/2009 briefing est.)
Remove Foam	cf	44,445	\$ 0.24	\$ 25.25	\$ 1,122,236	\$ 1,122,236	\$ 1,122,236	CME, Inc. estimate of foam volume (10/9/2008). Allied Defense Recycling, LLC, foam removal quote. Assumes contingency for access included in the cf cost.
Remove/treat non-oily water	gal.	500000	\$ 0.07	\$ 0	\$ 35,955	\$ 35,955	\$ 35,955	Means 16 01 9023.
Pumping equipment	each	1	\$ 1,171	\$ 1,203	\$ 1,203	\$ 1,203	\$ 1,203	Means 33 01 0508.
Carbon Filter	each	2	\$ 10,750	\$ 11,043	\$ 22,087	\$ 22,087	\$ 22,087	Means 33 13 2021.
Secure equipment	Day Rate	2	\$ 2,500	\$ 2,500	\$ 5,000	\$ 5,000	\$ 5,000	
Barge/Tug/Light Crane/Crew	Day Rate	45	\$ 1,000	\$ 1,000	\$ 45,000	\$ 45,000	\$ 45,000	Used to provide access/storage for foam, paint chip and hazardous waste removal. Equipment/Manpower verbal estimate Ryba .....
<b>VESSEL PREPARATION - TRANSPORT</b>								
Engineering/Inspections	Hrly.	60	\$ 125	\$ 125	\$ 7,500	\$ 7,500	\$ 7,500	T&T Bisso (marine salvage company).
Deck and superstructure preparation	Day Rate	20	\$ 5,500	\$ 5,500	\$ 110,000	\$ 110,000	\$ 110,000	T&T Bisso.
Below Deck preparation	Day Rate	20	\$ 5,500	\$ 5,500	\$ 110,000	\$ 110,000	\$ 110,000	T&T Bisso.
Hull preparation	Day Rate	8	\$ 5,500	\$ 5,500	\$ 44,000	\$ 44,000	\$ 44,000	T&T Bisso.
Tow preparation/floats/rigging	Day Rate	2	\$ 5,500	\$ 5,500	\$ 11,000	\$ 11,000	\$ 11,000	T&T Bisso.
<b>VESSEL - DISPOSAL</b>								
Tugs (3)	Hrly.	90	\$ 1,900	\$ 1,900	\$ 171,000	\$ 171,000	\$ 171,000	T&T Bisso.
Scuttling Crew and standby equipment	Day Rate	4	\$ 10,000	\$ 10,000	\$ 40,000	\$ 40,000	\$ 40,000	T&T Bisso.
Pilots	Est Tariff	1	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	T&T Bisso.
NAV position/side-scan/as-built	L.S.	1	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000	Ballard Diving and Salvage (BD&S).
<b>SUBTOTAL</b>							<b>\$ 2,065,745</b>	
<u>Indirect Capital Costs</u>								
<b>Health and Safety Implementation - 20%</b>							\$ 363,149	
<b>Overhead and Profit (Means Costs Only) - 20%</b>							\$ 251,449	
<b>Permit Acquisitions - 5%</b>							\$ 90,787	
<b>Contingency Allowance - 25%</b>							\$ 516,436	
<b>TOTAL</b>							<b>\$ 3,287,566</b>	

RSMeans' 2004 *Environmental Remediation Cost Data - Unit Price* and RSMeans' 2004 *Environmental Remediation Cost Data - Assemblies*, were used for certain unit costs estimates as indicated. Costs have been escalated from 2004 to 2011 using a 2.7% inflation rate, based upon the rates published in Appendix C of *Circular A-94 Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs* (United States Office of Management and Budget, January 2009).

TABLE 2: Alternative 2: Ocean Disposal with Partial Decontamination and TSCA PCB Bulk Product Waste Risk-Based Disposal Approval

**PRESENT VALUE CALCULATION**

YEAR	CAPITAL COSTS (\$)	ANNUAL O&M (\$)	OTHER PERIODIC	TOTAL COST	TOTAL PRESENT VALUE COST (\$) *
0			\$156,250.00	\$156,250.00	\$156,250.00
1			\$156,250.00	\$156,250.00	\$152,142.16
2	\$3,286,061.00			\$3,286,061.00	\$3,115,550.06
3				\$0.00	\$0.00
4				\$0.00	\$0.00
5				\$0.00	\$0.00
6				\$0.00	\$0.00
7				\$0.00	\$0.00
8				\$0.00	\$0.00
9				\$0.00	\$0.00
10				\$0.00	\$0.00
11				\$0.00	\$0.00
12				\$0.00	\$0.00
13				\$0.00	\$0.00
14				\$0.00	\$0.00
15				\$0.00	\$0.00
16				\$0.00	\$0.00
17				\$0.00	\$0.00
18				\$0.00	\$0.00
19				\$0.00	\$0.00
20				\$0.00	\$0.00
21				\$0.00	\$0.00
22				\$0.00	\$0.00
23				\$0.00	\$0.00
24				\$0.00	\$0.00
25				\$0.00	\$0.00
26				\$0.00	\$0.00
27				\$0.00	\$0.00
28				\$0.00	\$0.00
29				\$0.00	\$0.00
30				\$0.00	\$0.00
<b>TOTAL =</b>				<b><u>\$3,598,561.00</u></b>	<b><u>\$3,423,942</u></b>

\* Discount Rate 2.7%

**TABLE 3: Alternative 3: Ocean Disposal with Partial Decontamination and TSCA 9b Finding for Disposal of PCBs under the Marine Protection, Research, and Sanctuaries Act (MPRSA)**

ITEM	UNITS	QUANTITY	UNIT COST	TOTAL UNIT COST	ACCESS CONTINGENCY	TASK COST	DESCRIPTION/ASSUMPTIONS
<u>Capital Costs</u>							
<b>VESSEL PREPERATION - DECONTAMINATION</b>							
Remove and incineration electrical wiring	LB	10730	\$ 2.27	\$ 24,360	\$ 24,360	\$ 48,720	Means 16 02 0701. Assumes 14,850 pounds of insulation on LST 1166 and that 50% is PCB-containing and will require removal and disposal. 100% access contingency.
Remove/dispose solid/hazardous waste (2000 lbs.)							Assumes material is already drummed.
Drummed Waste Shipment Charge	each	1	\$ 2,801.39	\$ 2,801	\$ 2,801	\$ 5,603	Means 33 19 0201. Assumes 100% contingency for loading.
Transport Drums	mile	100	\$ 2.00	\$ 200		\$ 200	Means 33 19 0204.
Landfill Hazardous Waste 55-Gal Drums	each	3	\$ 117.49	\$ 352		\$ 352	Means 33 19 7202.
Remove/dispose friable paint/chips - 600 lbs. Labor	hours	450	\$ 45.19	\$ 20,336		\$ 20,336	Means - 25 02 01. Assuming a crew of 1 could vacuum a 50ft <sup>2</sup> area in 0.25 days. Therefore a crew of 1 could vacuum a 9000 ft <sup>2</sup> area in 45 days.
Land Transport Drums	mile	100	\$ 2.00	\$ 200		\$ 200	Means 33 19 0204.
Landfill Hazardous Waste 55-Gal Drums	each	3	\$ 117.49	\$ 352		\$ 352	Means 33 19 7202.
Remove/dispose PCB paint	ft <sup>2</sup>	12,000	\$ 15.24	\$ 182,938		\$ 182,938	Means 25 02 0104. 6 rooms at 2000 sq.ft./room. CCS cost estimate with 100% access contingency. Disposal 6 drums of chips @ 218/drum (11/10/2009 briefing est.)
Remove Foam	cf	44,445	\$ 25.35	\$ 1,126,681		\$ 1,126,681	CME, Inc. estimate of foam volume (10/9/2008). Allied Defense Recycling, LLC, foam removal quote. Assumes contingency for access in included in the cf cost.
Remove/treat non-oily water	gal.	500000	\$ 0.07	\$ 35,955		\$ 35,955	Means 16 01 9023.
Pumping equipment	each	1	\$ 1,203	\$ 1,203		\$ 1,203	Means 33 01 0508.
Carbon Filter	each	2	\$ 11,043	\$ 22,087		\$ 22,087	Means 33 13 2021.
Secure equipment	Day Rate	2	\$ 2,500	\$ 5,000		\$ 5,000	
Barge/Tug/Light Crane/Crew	Day Rate	45	\$ 1,000	\$ 45,000		\$ 45,000	Used to provide access/storage for foam, paint chip and hazardous waste removal. Equipment/Manpower verbal estimate Ryba Marine (3/1/11).
<b>VESSEL PREPERATION - TRANSPORT</b>							
Engineering/Inspections	Hrly.	60	\$ 125	\$ 7,500		\$ 7,500	T&T Bisso.
Deck and superstructure preparation	Day Rate	20	\$ 5,500	\$ 110,000		\$ 110,000	Includes barge, crain, welding crew OSHA 4 man dive crew 4 & 8 hour min.
Below Deck preparation	Day Rate	20	\$ 5,500	\$ 110,000		\$ 110,000	T&T Bisso.
Hull preparation	Day Rate	8	\$ 5,500	\$ 44,000		\$ 44,000	T&T Bisso.
Tow preparation/floats/rigging	Day Rate	2	\$ 5,500	\$ 11,000		\$ 11,000	T&T Bisso.
<b>VESSEL - DISPOSAL</b>							
Tugs (3)	Hrly.	90	\$ 1,900	\$ 171,000		\$ 171,000	T&T Bisso.
Scuttling Crew and standby equipment	Day Rate	4	\$ 10,000	\$ 40,000		\$ 40,000	T&T Bisso.
Pilots	Est Tariff	1	\$ 5,000	\$ 5,000		\$ 5,000	T&T Bisso.
NAV position/side-scan/as-built	L.S.	1	\$ 10,000	\$ 10,000		\$ 10,000	BD&S.
<b>SUBTOTAL</b>						<b>\$ 2,003,127</b>	
<u>Indirect Capital Costs</u>							
<b>Health and Safety Implementation - 20%</b>						\$ 400,625	
<b>Overhead and Profit (Means Costs Only) - 20%</b>						\$ 279,181	
<b>Permit Acquisitions - 5%</b>						\$ 100,156	
<b>Contingency Allowance - 25%</b>						\$ 500,782	
<b><u>TOTAL</u></b>						<b><u>\$ 3,283,873</u></b>	

RSMMeans' 2004 Environmental Remediation Cost Data – Unit Price and RSMMeans' 2004 Environmental Remediation Cost Data – Assemblies, were used for certain unit costs estimates as indicated. Costs have been escalated from 2004 to 2011 using a 2.7% inflation rate, based upon the rates published in Appendix C of Circular A-94 Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs (United States Office of Management and Budget, January 2009).

TABLE 4: Alternative 4: Decontamination, Dismantling, Recycling and Disposal

ITEM	UNITS	QUANTITY	UNIT COST 2010	UNIT COST	TOTAL UNIT COST	ACCESS CONTINGENCY	TASK COST	DESCRIPTION/ASSUMPTIONS
<u>Capital Costs</u>								
<b>VESSEL PREPARATION - DECONTAMINATION</b>								
Remove/treat non-oily water	gal.	500000	\$ 0.07	\$ 0.07	\$ 35,955		\$ 35,955	Means 16 01 9023.
Pumping equipment	each	1	\$ 1,171	\$ 1,203	\$ 1,203		\$ 1,203	Means 33 01 0508.
Carbon Filter	each	1	\$ 10,750	\$ 11,043	\$ 11,043		\$ 11,043	Means 33 13 2021.
<b>VESSEL PREPARATION - TRANSPORT PREPARATION</b>								
Engineering/Inspections	Hrly.	60	\$ 125	\$ 125	\$ 7,500		\$ 7,500	T&T Bisso.
Deck and superstructure preparation	Day Rate	3	\$ 5,500	\$ 5,500	\$ 16,500		\$ 16,500	T&T Bisso.
Below Deck preparation	Day Rate	3	\$ 5,500	\$ 5,500	\$ 16,500		\$ 16,500	T&T Bisso.
Hull preparation	Day Rate	3	\$ 5,500	\$ 5,500	\$ 16,500		\$ 16,500	T&T Bisso.
Tow preparation/floats/rigging	Day Rate	1	\$ 5,500	\$ 5,500	\$ 5,500		\$ 5,500	T&T Bisso.
<b>VESSEL - TRANSPORT</b>								
Tugs (3)	Hrly.	90	\$ 1,900	\$ 1,900	\$ 171,000		\$ 171,000	Assumes Dry Dock is within 30 hours of tug time.
Pilots	Est Tariff	1	\$ 5,000	\$ 5,000	\$ 5,000		\$ 5,000	T&T Bisso.
<b>VESSEL DISPOSAL</b>								
Dry Dock	mo.	3	\$ 150,000	\$ 150,000	\$ 450,000		\$ 450,000	
Remove and incineration electrical wiring	LB	10730	\$ 10.07	\$ 2.27	\$ 24,360	\$ 24,360	\$ 48,720	Means 16 02 0701. Assumes 14,850 pounds of wiring and insulation on LST 1166 and that 50% is PCB-containing and will require removal and disposal. 100% access contingency.
Remove/dispose solid/hazardous waste (2000 lbs.)								Assumes material is already drummed.
Drummed Waste Shipment Charge	each	1	\$ 2,727	\$ 2,801.39	\$ 2,801	\$ 2,801	\$ 5,603	Means 33 19 0201. Assumes 100% contingency for loading.
Transport Drums	mile	100	\$ 1.95	\$ 2.00	\$ 200		\$ 200	Means 33 19 0204.
Landfill Hazardous Waste 55-Gal Drums	each	3	\$ 114.37	\$ 117.49	\$ 352		\$ 352	Means 33 19 7202.
Remove/dispose PCB paint	ft²	12,000	\$ 14.84	\$ 15.24	\$ 182,938		\$ 182,938	Means 25 02 0104. 6 rooms at 2000 sq.ft./room. CCS cost estimate with 100% access contingency. Disposal 6 drums of chips @ 218/drum (11/10/2009 briefing est.)
Remove Foam	cf	111,113	\$ 0.24	\$ 16.71	\$ 1,856,690		\$ 1,856,690	CME, Inc. estimate of foam volume (10/9/2008). Allied Defense Recycling, LLC, foam removal quote.
Recycle/dispose superstructure	ton	2,400	\$ (350)	\$ (350)	\$ (840,000)		\$ (840,000)	Credit for recycle steel.
Dismantle vessel	Day Rate	50	\$ 15,000	\$ 15,000	\$ 750,000		\$ 750,000	Labor and equipment BD&S quote.
Crane Rental	Hrly.	42	\$ 250	\$ 250	\$ 10,500		\$ 10,500	Labor and equipment BD&S quote.
Barge/Tug/Light Crane/Crew	Day Rate	30	\$ 1,000	\$ 1,000	\$ 30,000		\$ 30,000	Used to provide access/storage for vessel preparation. Equipment/Manpower verbal estimate Ryba Marine (3/1/11).
<b>SUBTOTAL</b>							<b>\$ 2,781,705</b>	
<u>Indirect Capital Costs</u>								
<b>Health and Safety Implementation - 10%</b>							\$ 278,171	
<b>Overhead and Profit (Means Costs Only) - 20%</b>							\$ 418,797	
<b>Permit Acquisitions - 0%</b>							\$ -	
<b>Contingency Allowance - 25%</b>							\$ 695,426	
<b>TOTAL</b>							<b>\$ 4,174,099</b>	

RSMeans' 2004 Environmental Remediation Cost Data – Unit Price and RSMeans' 2004 Environmental Remediation Cost Data – Assemblies, were used for certain unit costs estimates as indicated. Costs have been escalated from 2004 to 2011 using a 2.7% inflation rate, based upon the rates published in Appendix C of Circular A-94 Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs (United States Office of Management and Budget, January 2009).

## APPENDIX B

### **B.1 Contaminant Specific ARARs**

Contaminant specific requirements include Hazardous and Solid Waste, Resource Conservation and Recovery Act (RCRA) Subtitle C – Hazardous Waste Characteristics, and RCRA Subtitle D – Non-hazardous Solid Waste (40 CFR Parts 257 and 258), Oregon Department of Environmental Quality Solid Waste Management (ORS Chapter 459) and Hazardous Waste and Hazardous Materials Management (ORS Chapters 465 and 466), and the Toxics Substance Control Act (TSCA) (40 CFR 761 Subpart D).

### **B.2 Location Specific ARARs**

The geographic and physical position of the LST-1166 determines the ARARs regarding the concentration of hazardous substances and cleanup activities due to their location in the environment. The Fish and Wildlife Conservation Act, Migratory Bird Treaty Act (MBTA), Endangered Species Act (ESA) (16 USC 1531; 40 CFR Part 6.302; 50 CFR Part 402), Marine Mammal Protection Act (MMPA) and Fish and Wildlife Coordination Act (FWCA) are all applicable for the vessel at its moorage and along the entire distance to its disposal location. Once the final alternative is selected the substantive requirements of applicable elements of each Act must be met. Best Management Practices (BMPs) are also applicable to each alternative. The National Historic Preservation Act (Public Law 89-665; 80 Stat. 915; 16 U.S.C. 470) was potentially applicable, but the Oregon State Historic Preservation Office determined that the vessel is not eligible for National register of Historic Places (Johnson 2011). Something to be considered is the decorated service record of the vessel and individuals that may have an interest in its future.

The Marine Protection, Research, and Sanctuaries Act (MPRSA) is applicable. The MPRSA General Permit for Ocean Dumping (40 CFR 229.3) for transportation and disposal of vessels is applicable. Exterior paint, including paint flakes on the exterior hull, are not generally considered “readily detachable” under the general permit. [40 CFR 229.3(3)(ii)]. However, to the extent strips of exfoliating paint could be readily detached, they should be addressed as a material which could degrade the marine environment and would need to be removed to the maximum extent practicable. Paint flakes that might become dislodged during transportation or disposal are not assumed to create “debris” or to contribute to “chemical pollution” under the general permit. Protection of Wetlands Order (40 CFR Part 6), is also applicable.

### **B.3 Action Specific ARARs**

Action specific ARARs for include the CWA, Section 404 (33 CFR Part 336 ), Wetlands - Protection of Wetlands Order (40 CFR Part 6), Hazardous and Solid Waste, Resource Conservation and Recovery Act (RCRA) Subtitle C – Hazardous Waste Characteristics, and RCRA Subtitle D – Non-hazardous Solid Waste (40 CFR Parts 257 and 258), Oregon

Department of Environmental Quality Solid Waste Management (ORS Chapter 459) and Hazardous Waste and Hazardous Materials Management (ORS Chapters 465 and 466), TSCA (40 CFR 761 Subpart D).